

EOS, Transactions, American Geophysical Union

Vol. 64, No. 2, Pages 9 - 16

January 11, 1983

Tectonophysics

Since Proceedings A CAPTURED SIALED CHAIN IN THE COAST RANGS, ORGOON AND MASHINGTON B. A. Puncan (School of Oceanography, Oceano

Risse Flain and the Vallowerse area.

J. Goophys. Res., Red. Faper 281513

\$150 Plate Inctonts

COLLISISS PROCESSEE IN THE BUSTMERN MOLUCEA SEA

Gragory F. Moore (Citins Service Co., EEG Research,
P.S. Boe 3906, Toles, OK 74102), Cil A. Silver

The Mindanac-Malucca Sea region is a collision zone
between two facile is fined are systems. The wast Mindanao Arc, which was notive from the Cretacomy through
the Questern systems. The wast Mindanao Arc, which was notive from the
Cretacomy through the Oligocese. Following the collition in the Miccase, tee Aquan-Davao Trough was tilled
with coarse clastic sectments. The ophicitie terrene
reposed is the Pulade Panismie was probably explaced
for ing this collision.

In the Molocce See region, the collision between the
Malashara Arc and the Sangiba Arc is ntill sotive. Gravity data and seissic reliaction provides indicate a
crustal break between the Tehnok Ridge and somthere
Mindanao. The deformed rocks of the Telsed Islands probably represent the northern light of the forsers tarrase of the Malashera Arc syntam. The East Sangths and
Mast Malashera Invest can be Iodiowed in satesic rerese of the Malashera Arc syntam. The East Sangths and
Mast Malashera Invests can be Iodiowed in satesic rereside of the Snellins Sidge complan reasons obscure,
but he is terpret it to be the northern stansion of the
Malashera Arc tarrases.

A Lactacic reconstruction for this complas region propuses that the collision in the Mindanao region occurred bebases the later-occenin, arc tarrans with very
ittin letzrasing sediment. The southern end of the
next of the Malashera Arc by a traisitym fast, is sugyess that the thick sediments proving the the Sugpass that the thick sediments proving the collision in the Mindanao region occurred bebases the Sanghaper Arc by a traisitym fast, is sugyess that the thick sediments proving the the Sanghaper Arc by a traisitym fast, is sugyess that the thick sediments proving the collision in the proving the collision in the proving the c

DISO Plate testonics

LATERAL EXENCISING OF THE WHILITPINE SEA PLATE

SUBDOCTION ALON'S THE NAMENT-BURGUE TROUGH

8. Ukame Netional Research Center for Disaster

Prevention, Hitherigum, Inbreshi 305, depan)

Focal mechanisms are investigated for shillow onth
quakes in 4 50 kml of central Jugan by using rela
matured selsmic date of storceorthquakes. Shillow

sarthquates to camtral and southwestern Japan can be

distinguished late thram groups, opper crustal carth
quakes, schorustal marrhquatus and interplate thrust

sarthquakes, the first and the second ones being

sabjents of the present study. Nost of the upper

crustal earthquakes are of strike alip type or reverse

faulting with E-M to SE-M compression, whereas the

subcrustal earthquakes are of strike alip type or reverse

faulting with E-M to SE-M compression, whereas the

subcrustal selsmic onne, subperallol to the Wantal

trough, becomes progressively desper lendward to the

subcrustal selsmic onne, subperallol to the Wantal

trough, becomes progressively desper lendward to the

subcrustal selsmic onne, subperallol to the Wantal

trough, becomes progressively desper lendward to the

subcrustal selsmic onne, subperallol to the Wantal

trough, becomes progressively desper lendward to the

subcrustal selsmic onne, subperallol to the Wantal

trough, becomes progressively desper lendward to the

tit emerges into a very shallow sates outlytty io the

sub warster of the progression activity io the

distribution, thres diseasional salsmic velocity strec
ture, and focal mechanisms, subcrustal earthquaken are

considered to occur within the subducting Wallippina

Sus plate that extends down to a depth of at least

do hm. On the besis of this and other focal mecha
nies studies, atress trajectories are Grawn for the

subducting Wallippine Sas plate and foat the overriding

Burasion plate. The overriding place as, on the

whela, under the 4-M compression which confolms with

other head, is under lateral extension along les

strike. We interpret that the lat very donnard, being constrained laterally at the arctar junation, and thereby comen under leteral stretching. The leteral constraints arise alther from appearst indrease in flexutal strength of the plate at the arctary junction or from booyancy of a missioncontinum that resists subduction. (hit)lopine despite, focal machenism, excess trejectories).

\$159 Tectonophysics D'late Tectonics!
CHUSTAL STRUCTURE O'A SIRORT LENITH THANSTORM
PAULT IN THE CENTRAL MARIANA THOUGH

3. B. Sinton (Conce Inc., P. O. Bex 1267, Ponce City,
Okioheme 74601 and D. M. Hissong
The crustal structure of the Pagan Proclure Zena, e short
length transform lawts system in the central Mariana Trough
was deformined from a detelled selsante refraction stady using
occan bottom reignomators. The Mariana Trough is a backere bank with a agreeding center opening of a bail ret of less
then 2 Cm/yr. Interpretation of both the selamic travel lines
and amplituden suggest that the crust within the transform
valley is 1 to 1.5 km interpretation of both the selamic travel lines
and amplituden suggest that the crust within the transform
valley is 1 to 1.5 km interpretation of both the selamic travel lines
and amplituden suggest that the crust within the transform
valley is 1 to 1.5 km interpretation of the transform lauts, but in hicker than fracture zone crust in longer transform clissi
nystoms. The crustal dillerences can be accounted for rolei;
by thickoning, relative to longer transform and transform offsel
nystoms. The crustal dillerences can be accounted for rolei;
by at much on 3.8 km. Other major dillerences between the
Pagan short i transform system and transform systems of
greater lengths ore fit the transition from Pagan transform
crust to occanic crust is only 2.0 to 0.0 km wide compared to
your transform, and (1) whereas bathymetric ridge
perallel to longer transform systems are underlain by high
dinnsty material, the saitre valley of the Pagan transform
nystem is understain by high density material. These
dillerences can be oxplained by the dillarent thermal
properlias of the third wall at the spreading centerfransform
intersentions, and its effect on crustal accrotion. As the diff
wall becomes colder, the crust becomen thioner, the tree of
gravity sommely is larger, the transition from transform to
occanic crust is wider, and the bachymetric relial serves the
valley is greater. No sig oer. Ser., vol. 27. Au

Yews

NSF Directors Asked to Resign

Edward A. Knapp, the Reagan administra-tion's appointee to replace former NSF Direc-tor John Slaughter, who left the post to become chancellor of the University of Maryland, has asked for, and received, the resignation of Deputy Director Donald N. Langenberg, Knapp has also requested the resignations of Assistant Directors Francis S. Johnson (astronomical, as assphere, earth. and ocean sciences) and Eloise E. Clark (biological, behavioral, and social sciences). This leaves only one post at the top management levels of NSF: the assistant director for mathematics and physical sciences—a post held. until Slaughter's resignation, by Kuapp. The new director is the only one of the former top managers remaining; no assistant directors have yet been named.

On the surface the management changes appear to be a bit fast, a 'clean sweep,' as it were. Knapp is a former Los Alamos associate of President Reagan's science advisor, George Keyworth 11. Further, Knapp's name was not on any of the lists of directorial candidates proposed by the National Science Board. Normally, NSF directors are chosen, more or less apolitically, for their abilities as scientists, not necessarily as managers. Knapp had been at Los Alamos for 24 years before joining NSF a few months ago. He came from a job as head of the Accelerator Technology Division. Thus, the picture at the NSF may look to the casual observer as a 'shakeup of sorts.

For a few days after the announcements ranks of middle and lower management at NSF. At the National Science Buard, which governs and advises NSF activities, Chairman Lewis M. Branscomb said, 'I fear the manner in which these personnel decisions were made and announced will exacerbate unr ability to find highly qualified candidates who will accept' (Science, Dec. 24, 1982). But, Branscomb also acknowledged that

the new director should be able to select his staff. The director, deputy director, and assistant director positions at NSF are customarily filled by presidential appointment, and it would be premature to judge the political motivation before the posts have been filled. Furthermore, in every instance, except per-haps in the case of Eluise Clark, who will remain at NSF for a while, there were mitigating circumstances affecting the resignations. Donald Langenberg is to become the Chan-cellor of the University of Illinois, Chicago campus. Geophysicist Francis Johnson had already made it known that he was returning to the University of Texas at Dallas.

For the present the NSF budget has not been subjected to overall reductions; NSF got its appropriations this year and did not have

to await a congressional continuing resolution. According to Branscomb, ... the President has apparently given high priority in NSF ... (Science, Sup.), and the next fiscal year budget may be increased, eren in the area of the social sciences. Feelings within the earth sciences community range from hesitation to discuss the specific and pri tion to disquiet, because the specifics and priorities for future NSF programs remain in question. After all, the National Science

Foundation is not set up to manage science; projects supported by NSF funds are, for the most part, unsolicited research proposals. Accoroling to a recent discussion of the Reagan administration's position with regard to the NSF, however: The Presidential Personnel Office, the White House unit responsible for presidential appointments, has long wanted Reagan apprentices in the Foundation and applied pressure on Knapp to request the resignations,' (Science, sup.). In another published report it was stated that 'A chief concern is that it (the removal of all apparent as sistant directors) will make NSF more subject to the political whims of future administrations,' (Chem. Eng. News, Dec. 20, 1982).
Recently, at the 20th anniversary of SLAC

(Stanford University Linear Accelerator Facility), Presidential Science Advisor Keyworth gave his views of what he described as a major problem to be overcome; that is, the attitude of the American scientific community. According to a report of his comments (indust. Res. Develop., Dec. 1982): 'Our result of the abundant Federal funding of past decades ... (argued Keyworth) ... is the feeling among researchers that they need not pay attention to the profit incentive. . . . The comucopis of 1960's science plainly is gone forever; the new order, even in basic research, invoives a truly hardnosed evaluation of the real value of individual research projects. In the same report, however, George Keyworth was quoted us saying that the United States has The strongest basic research enterprise that the world has ever known . . . a resource of such importance that there's no question about our high priority to protect and main-min it (Indust. Res. Pevelop, sup.).—PMB

Tapping the Magnetosphere

Scientisis may have turned a way to tap the earth's magnetosphere to help power global communications. A team of scientists and engineers from Lockheed's Palo Alto Research Laboratory, from Stanford University, and from the U.S. Office of Naval Research reported at the recent AGU Fall Meeting/ASLO Winter Meeting that they have confirmed a long-held theory that man-made very low fre-quency (VLF) radio waves move along the earth's magnetic field lines to great altitudes within the magnetosphere and dislodge elec-

trons into the ionosphere. The confirmation of the theory aids in the understanding of communication disturbances caused by increased sunspot activity and broadens the po-tential for advancement in new forms of radio communication.

The magnetosphere is the region of space where the earth's geomagnetic field is confined by the solar wind. The ionosphere, closer to the earth than the magnetosphere, is that part of the earth's atmosphere that contains free, electrically charged pardeles. Radio continunication could be improved

by using magnetic field lines to capture and amplify VLF radio waves 30-40 dB-more than 1000 times—by using energy drained from electrons precipitated from the earth's radiation belts into the ionosphere, according to Joseph B. Reagan, manager of die Lockheed Space Sciences Laboratory. VLF communication uses radio waves with long wavelengths that travel across large portions of the

The process of dumping electrons from the earth's radiation belts into the upper ionosphere occurs constantly. The earth's nearspace environment is a complex equilibrium f inputs, primarily from the sun, and losses, which occur as electrons are drizzled out of the radiation belts. This drizzling can be caused both by natural events and by transmitters on earth. However, the magnitude of the human-induced effect was unknown until Reagan's team successfully linked the effect of electron precipitation directly to an earth transmitter. It is possible, Reagan estimated. that under some conditions high-power transminers induce half of the electron precipita-

For many years it has been known that transmissions from high-power sources could penetrate through the ionosphere and leak into the magnetosphere, interacting with the electrons along the Van Allen belts. Huwever, the waves of these transmissions can be auplified, resulting in an alteration of the pitch angle of the electrons and thus the precipitation of electrons from the magnetospheric field lines. Until the present experiment, dubbed SEEP for Stimulated Entission of Energetic Particles, this cause and effect had not een definitirely shown.

SEEP scientists employed three Navy VLF transmitters and one operated by Stanford in Siple, Amarctica, to send a predetermined pattern of signals—3 seconds on, 2 seconds infi-Into the magnetosphere. The signal pat-tern traveled along the earth's field lines and were then 'duplicated in the form of elec-trons entering the lonosphere over a region several hundred miles long, Reagan said. 'When these freed electrons enter the ionosphere, they create a miniature aurora borealis-small light emissions-iliai can be detected by an airglow photometer,' Reagan noted. 'In addition, X rays are released that can be picked up by a mapping X ray spec-

Reagan said that ongoing magnetuspheric research will 'help us better understand the physics of the magnetosphere and the ebb and flow of the radiation belts. When we fully understand this process, there is the potential of expanding communications into the

IAHS Notes

Nominations from national committees and commissions for the International Association of Hydrological Sciences (IAHS) elections--to be held in Hamburg, F.R.G., during the XVIII General Assembly of the International Union of Geodesy and Geophysics, August
15-27, 19B3--should be submitted as soon as
possible to J. C. I. Dooge, Department of Civil Engineering, University College, Upper
Merion Street, Dublin 2, Ireland, Dooge is
chairman of the IAHS populations page! chairman of the IAHS nominations panel.

Others on the panel are Dr. Bogoiavlensky, N. B. Ayibotele, Dr. Rodier, and Mark Meier. In addition, nominations from national committees for the 1983 International Hydrology Prize will be open until April 1. Nominations should contain a statement (up to 1000 words) describing the qualifications and merits of the candidate. By definition, candidates should have made an outstanding contribution to the advancement of hydrology. Send nominations to IAHS Secretary General John C. Rodda, Institutes of Hydrology, Wallingford, Oxon OX10 8BB, UK.

The working group on the IAHS reorganizadon, chaired by G. Kouvács, produced a draft report that was discussed at the July 1982 IAHS First Scientific General Assembly at Exeter. As a result of those discussions in commissions, in the IAHS bureau, and in the IAHS plenary sessions, proposals will be made at the Hamburg meeting to amend the IAHS statutes and bylaws. In accordance with the existing stanues and bylaws, details of the proposed changes are contained in the December issue of the IAHS Newsletter.

Geophysicists

Murray J. Boron became the director of the EISCAT (European Incoherent Scatter) Scientific Association this past fall. He is on leave of absence from Ski international, which is based in Menlu Park, Calif. The former EISCAT director, Tor Hagfors, has assumed the position of director of the National Armospheric and Ionospheric Center (NAIC) at Cornell University. Jürgen Röttger, of the Max Planck Institute for Aeronomy. has been appointed EISCAT associate direc-

Cinna Lomnitz, professor of seismidagy at the National University of Mexico and a member of the Instituto de Investigaciones en Matematicas Aplicadas y en Sistemas, has been appointed corresponding member of the Academy of Sciences of Chile. He is a member of the Mexico Academy of Sciences.

Hans A. Panofsky, an AGU Life Fellow, rethred September I as Evan Pugli Professor Emeritus of Atmospheric Sciences at The Pennsylvania State University. Contributions are invited to the Hans A. Panofsky Scholar-ship Fund, established at Penn State to provide scholarships for outstanding students in meteorology. Checks payable to The Pennsylvania State University and designated to the Panofsky Fund may be sent to the Office of Gifts and Endowments. Old Main, University

Books

The Properties of Groundwater

G. Matthess, Wiley-Interscience, New York, xii + 406 pp., 1982, \$45.95.

Reviewed by Frank T. Carnecio

Scientists and engineers concerned with the environmental aspects of groundwater frequendy require a comprehensive reference lext that provides an overview of the per nent problem, appropriate decision making criteria and a guide to relevant references. The Properties of Croundwater, translated from the German by John C. Harvey, is a welcome addition to the select books currendy available in this field. The book occupies the niche that lies between Hem's classic Study and Interpretation of the Chemical Charocteristic of Natural Water (U.S.G.S., Water Supply Pap. 1473, 363, pp., 1970), Stumm and Morgan's Aquatic Chemistry (John Wiley, New York, 780 pp., 1970), and Freeze and Cherry's Croundwater (Prentice-Hall, Englewood Cliffs, N.J., 604 pp., 1979). The level of presentation, coupled with the cost, may limit the use of the book to advanced seminar; courses and, more appropriately, as a solid reference text for scientists and researchers concerned with water and water quality. The table of contents is well indexed and is structured to allow the reader to review effectively the subject matter.

The book is divided into four sections. In the first section, the physical and geochemical nature of water is reviewed as well as the physical chemistry of solutions and mineral equilibria. Matthess pays particular attention to near-surface geochemical processes and re-

lates soil-gas composition to groundwater quality. A background in geochemistry, al-though not necessary, would facilitate the comprehension of the material presented.

The second chapter emphasizes rock-water Interactions and the chemical factors infecting the distribution, nature, and concentration of various chemical and ionic species. The suthor presents material gleaned from a vnriety of sources within the context and framework of an interrelated atmospheric-rock composidon-biologic processes model and discusses quality determinations. The various biologic processes operating in the soil-near stirface environment are shown to influence ground gas composition, which in turn is related to the causal water quality controls. One gains an appreciation of the degree to which a mature soil profile, and its associated microbiologic community, affects the ultimate ground water chemistry. Researchers concerned with the reclamation of disturbed lands would find this section (and the beginning of chapter 3) most useful in understanding the various interrelationships afforded by the near-surface biologic processes, the Impartance of vegeta-tion in the total recismation procedure, and the direct and indirect effects of organic matter on water quality. Matthess provides the reader with a refreshing insight into these near-surface processes and the important role they play in affecting water chemistry.
Throughout, the author uses numerous relevant case histories to illustrate the pertinent water quality variations and mechanisms of control. The chapter concludes with a good

overview of the man-made factors that affect

water quality that range from the indirect effects of changes in the composition of the at-

mosphere to the direct effects of discharging

Yehuda Bachmat John Bredshoell Barbara Andrews David Holtz Scott Sebastian

In the next chapter, the origins and occur-

rence of groundwater are discussed, beginning with precipitation quality variations, percolation water chemistry, and continuing with an excellent overview of the hydrochemical mechanisms responsible for the numerous water quality variations. A variety of major, minor, and trace element constituents are discussed in terms of their natural occurrence and the factors diat control their levels of

organic and radioactive wastes to the environ-

A relatively brief attempt is made to characterize groundwater quality in terms of the chemistry of the squifer. Understandably, the author restricts his attempts to broad generalizations and confines categories to regional hydrogeologic units. Nevertheless, distinctions between the water quality variations are

related to the aquifer materials and provide the reader with a starting point from which to seek additional Information.

The final chapter, dealing with the classification of groundwater and methods of presenting data, is an excellent and complete re-view of the various techniques available to perform these functions. A wide range of pictorial and multivariate diagrams are discussed and illustrated to provide the reader with an appreciation of the strengths and weaknesses of the various methods of depicting water ata and classify lowing, water classification schemes based on origin, dissolved constituents, and potential use are presented and are reviewed in terms. of applicability for a particular use. Errors in maximum permissible concentrations for some dissolved constituents in potable water could have been avoided by using more re-

A State of the Art Review

Discussions on groundwater models and

their applications in the management of water resource systems. Attention is focused on the kinds of models that have been developed and

their specific and general role in management the availability of the models and the informs

Uon, deta and technical experies needed to their operation and use.

Water Resources Monograph 5 Groundwater Management the use of numerical models 1980

Call \$90-424-2458 jol free - 462-6903 (local)

136 pp. Ulustrated List Price \$10

 AGU members are entitled to a 30% discount. Orders under \$50.00 must be prepaid.

Order from: American Geophysical Unio 2000 Florida Avenue, N.W. Washington, D.C. 20009



One major advantage this book has over its American counterparts is the degree to which foreign literature is cited and used in the discussions. Of the approximately 955 references, more than half are fureign. Thus, in addition to an exposure to the atodies reported in the foreign literature, the render gnins an appreciation of Isow the European school discerns the causal effects of water quality

Upon this blend of an American and European Information base, Matthess revelops some interesting and novel insights into the properties of groundwater. This look is recomniended as an addition to your library of reference texts.

Frank T. Caruccio is with the Department of Geology, University of South Carolina, Columbia

Geophyaicel Monogreph 26

Scientific Basis for **Nuclear Waste** Management

J. 13. Monre (ed.), vol. 3. Plenum, New York, xvii + 632 pp., 1981, \$49.50.

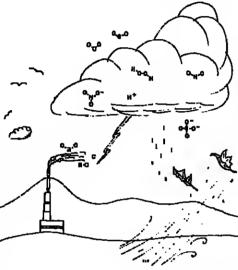
Reviewed by Newell J. Trask

As a result of the Reagan administration's commitment to nuclear energy as a signifitant fitture energy source and of attempts by the 97th Congress to grapple with legislative aspects of the problem, increased attention has focused recently on the problem of safely disposing of nuclenr waste. These proceedings of the Third Symposium un Nuclear Waste Management of the Materials Resenreli Society provide insight into the status of investigations on the subject as of late 1980. As with volumes I and 2 of this series, the 77 contributions are all short progress reports of ongoing research with the emphasis fittingly on materials science. Readera who wish exten-

ISBN 087590-051-8 1982

Heterogeneous Atmospheric Chemistry

David R. Schryer, editor



A single volume dealing with the dynamic chemical processes of the atmosphere: clusters, mioroparticles and perticles, gas-solid interaction, aqueous etudies,—the heterogeneoue reactions in the etmosphere. 32 papere devoted to en exchange of Ideas, Information and mathodologies from the meny fielde directly and indirectly related to the newly emerging eclence of Heterogenoue Atmospher ic Chemietry. The papers include reviews and new research resulte. Literelure on multiphese processes hae been extensive but ecaltered. This comprehenelve volume le velueble both to those actively engaged in this sludy end to those not yel involved because of the difficulties encountered by the dispersion of the litere-

● 280 pp ● Illuatrated ● \$27

 AGU members entitled to e 30% diacount Order from: American Geophysical Union

Weehington, D.C. 20009 or call toll Iree: 600-424-2488

482-6903 in the Weshington, D.C. eres

2000 Floride Avenue, N.W.

Prepayment by check, money order or credit card le required for all orders under \$50.



sive background material on the problems of nuclear-waste management and dispusal, details of specific sites, or overviews of the programs of research in this country and abroad will have to look elsewhere.

The prevniling strategy for waste disposal in mined repositories in most comunies uses a system of independent barriera that likeck or resist the migration of radionnelides away from the repository. The principal harriers are a waste package, a conservatively designed repository, and a geologic environment conducive to waste is dation. In terms of potential processes, the main rules taking place within the three barriers are (1) learliing of the waste and reaction with thirds which penetrate the waste package; (2) traction, precipitation, or solution of radiounclides with ambient waters and minerals at initially elevated temperatures; and (3) transport with attendant interaction along hydro-logic flow paths at low concentrations and temperatures in the far held, respectively.

These proceedings devote the unist space to the first line of defense; the waste form and the reactions it may undergo in its immedinte vicinity. In addition to physical descriptions of waste forms and production process es, there are sections on leaching, radiation effects, end natural anniogues. Both commer-cial and defense high level waste are included, and there is a section on mon-high-level waste. Within the category of high-level waste, borosilicate glass and alternative waste forms, including spent fuel, receive approximately equal treatment.

Compared with the earlier volumes, these proceedings devote increased space to the mechanisms of waste-form lenching. Several papers describe highly sophisticated surface and near-surface analytical techniques being used to study the renction layer that forms on die solid waste during exposure to an aqueous environment. Much remains to be learned about these mechanisms, especially at elevated temperatures and in the presence of additional phases used for canisters or overpacks. A series of papers describes a variety of metallie, ceramic, and polymeric materials under consideration for use as waste containers; other papers discuss the possible use of days, zeolites, and other materials as backfill. The effects of prolonged radiation doses on a variety of glasses and minerals are also explored, but lirur conclusions about these elfects are not yet possible.

The diversity and complexity of the re-search reports reemphasize how dillicult it is to simulate the functioning of an underground radioactive-waste repository for time periods of thousands of years. Decision-makers must rely on simplified but conservative models of repository performance reported on in other publications. These models prediet environmental impacts from decommis-siuned repositories well within acceptable lim-

its. In situ tests of repository huntions at acmal sites, operating experience, and continued laboratory and theoretical work. such as that reported in these proceedings are needed to custor that model calculations are resonable and that no significant phenoutena have been overbucked.

Newell J. Trusk o with the U.S. Geological Suppry. Reituo, l'ognioi.

New Publications

Items listed in New Publications can be ordered directly from the publisher; they are met available through AGU.

Advances in Hydroncience, vid. 13, V. 1. Chaw (Ed.), Arademic, New York, xi + 393 pp., 1982, \$53.0d

Boundary Element Methods in Solid Mechanics S. L. Cronch and A. M. Starfield, George Allen & Unwin, Bostron, Mass., xii + 322 рр., 1983, \$30.00.

The Boundacy Integral Equation Method for Pa-rous Media Flow, J. A. Liggett and P. L.-F. Lin, George Allen & Unwin, Boston, Mass., xi + 255 pp., 1989, \$35.10. Circulation in the Constal Ocean, C. T. Csanady,

Envices. Fluid Meck., D. Reidel, Hingham, Muss., xi + 270 pp., 1982, \$52.50. Comparative Ceystal Chemistry, R. M. Hazen and L. W. Finger, Wiley-Interscience, New York, xv + 231 pp., 1982, \$48.95.

Geophysical Mapping of Auried Precambrian Rocks in the Clonciary Area, Northwest Queensland, A. J. Mutton and R. A. Al-mond, Rep. 210, IIMR Microform MF95, Bureau of Mineral Resources, Camberra City, A.C.T., Australia.

Migration of Geophysical Data, F. A. Robiuson, International Human Resources Develrepment Corp., Bostron, Mass., x + 208 pp., \$34.00.

Mount St. Helens Eruptimus of 1980: Atmospheric Effects and Potential Climatic Impact, R. E. Newell and A. Deepak (eds.), NASA, Washington, D.C., xxvi + 119 pp., 1982, \$6.00. Order from Department 36-F, Superintendent of Documents, Washington, D.C. 20402; refer to stock munher 033-000-00857-1. Nor Any Drop to Drink, W. Ashworth, Summit,

New York, 272 pp., 1082, \$6.95. Petcology of the Ocean Floor, R. Hekinian, Ocenwagt, Ser., vol. 33, Elsevier, New York, xiv 4 193 pp., 1982, \$93.00. Physical Properties of Caystals, J. F. Nye, Oxford

University Press, New York, xili + 322 pp., 1979,

Pulse Coding on Saismolugy Met ternational Himan Resources Development Corp., lloston, Mass., vi + 89 pp.,

ANNOUNCEMENT



Classified

Rates Per Lines

Positions Wanted First insertion \$1.75 additional assertions \$1.50 Positions Available, Services, Supplias, Courses, and Aunouncements First insertion \$3.50 additional insertions \$2.73 Student Opportunities First insertion, not otherwise announced, free.
Additional Insertions \$1.50.

There are no discounts or commissions on classified ada. Any type that is not publisher's choice is charged for at general advertising rates. For is published weekly on Tuesday. Ads most be received in writing on Monday. I week prior to the date of

Replies to ada while how numbers should be addressed to Box _____ Antenian Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C.

For fusther information or to place an ad rall trill free 800-424-2488 or 462-6903 in the Washington,

Texas A&M University/Faculty Positions. The Department of Geology imites applications for several tenure-track laculty positions effective September 1983. Preferred specialics are in:

1. Engineering Geology;
2. Clar Mineralogy with emphasis on sedimentations, sees housing, and dissender.

University of Kantucky/Department of Geology. The Department of Geology Invites applications for two tenured track Assistant Professor level positions. Both appointments are for soft rock geologists preferably with some experience in industry and inferests including one of the following: sedimentology, straigraphy, carbonate petrology, organic geothemistry, or isotope geology. The successful applicants would be required to participate in active research, supervise gradume sudents and teach graduates and undergraduates. Familiarity with quantitative techniques is desired; Department has access to a variety of computational devices. Academic vitae and names of three references should be sent to Dr. Lyle Sendlein, Chairman, Search Committee, 321 Patterson Office Tower, University of Kentucky, Lexington, Kentocky 40506-0027. Closing date is March 1, 1983. Both appointments are to commence in August 1985, but an earlier date may be considered. Salary is negotiable.

The University of Kentucky is an equal opportunity/affirmativo action employer.

SITIONS AVAILABLE

same AAM University/Resulty Pealdons. The charactery flower of Cockey with a recomplement of Geology in the supplication for the particular of the part

Dapartment Head/Texas A&M University. The Department of Geology is engaged in a uniforwide search for a new Department Head widt the anticipated starting date being September 1, 1983. The position is open as to salary, rank and area of Interest. We are seeking a person with a national or international reputation in the geological sciences who would take over the leadership of our research and teaching oriented department.

Our faculty currendy numbers twency three and will increase by three by the Fall of 1983. Construction started in January, 1983 on a 60,000 square foot addition to the Halbouty Geosciences Building. We currently have an undergraduate enrollment of over 400 students and there are about 130 students in our graduate (M.S. and Ph.D.) program. The Department of Geology is in the College of Georgia.

in our graduate (M.S., and Ph.D.) program. The Department of Geology is in the College of Geosciences (Dean Gordon P. Eaton) along with the Departments of Geophysics, Oceanography, Meteorology and Geography. The tradidonal strengths of the department are in the areas of stratigraphy, sedimentation, paleontology, structure-tectonophysics and engineering geosciences. Our strong ties with industry are reflected in the level of financial support and jobs for our students. If you would like to be considered for this position, please submit a receni resume along with the names of at least three persons who are willing to write letters of recommendation. Send Applications To:

John M. Spang

Research Faculty Positions in Oceanography/University of Southorn California. Applications are invited for three research faculty positions. Individuals with established recards of excellence in sca-going research programs in biological, geological, chemical and playstral necanography are songlit. At least one appointment each in geological and biological oceanography is planned, individuals applying clinuid have coastal oceanography as their major geographical area of interest. Special attention would be given to applications from interdisciplinary teams, e.g., in benibic boundary layer studies, interaction of plankton and circulation, chemical biological transformations, etc. These positions carry a compliment of up to 60% of salver from 118G. biological transformations, etc. These positions carry a commitment of up to 60% of salary from USG July 1. 1983. Contact:
Dr. Richard Dugdale, Director
Allan Hancock Foundation
University of Southern California
Los Angeles, CA 90089-0372

Dr. Robert Douglas, Chalrman
Department of Geological Sciences
University of Southern California
Los Angeles, CA 90089-0741
USC is an equal opportunity/affirmadve action

Research Positions/Lunar and Planetary Laboratory. The Lunar and Planetary Laboratory at the University of Arizono has research positions open for Planetary Scientists, with Planetary Astronomy and Planetary Geology being areas of greatest interest to the Laboratory at this time. Researchers at the Laboratory have access to the University's oliservatorias, a wide pract of account of the Laboratory at the Laboratory at the Laboratory have access to the University's oliservatorias, a wide pract of accounties. tories, a wide renge of astronomical instrumenta-tion, a complete collection of planetary images, con-puters and laboratory facilities. The research ranks in the Laboratory, nausely Assistant Planetary Scientist, Associate Planetary Scientist, and Planetary Sci-endst parallel the tenure track ranks of Assistant, Associate and Full Professor. The Laboratory is in-terested in making appointments at the Assistant. Associate and Full Professor. The Laboratory is interested in making appointments at the Assistant or Associate Planetary Sciential level. These are not tenurable and not state-funded positions. Salary levels are commensurate with equivalent tenure-track ranks. Researchers in these positions will be expected to supply a significant portion of all of their salaries through their grants and contracts.

Applicants should submit a curriculum vita, list of publications, and the names of three references by April 30, 1983, to L. L. Wilkening, Director, Lunar and Planetary Laboratory, University of Arizona, Tucson, Arizona, 85721.

The University of Arizona is an equal opportunity, affirmative action employer.

Facolty Teaching and Research Posidon/Lostitute of Marine Science, University of Alaska, Fairbanks. Research interests should include the numerical modeling of estuarine, coastal and open ocean physical occanography in subpolar or polar environments. Participation in interdisciplinary environments. Participation in interdisciplinary studies is encouraged. Applicant should have an extensive background in hydrodynamics and numerical modeling. Ph.D. degree in physical oceanography is preferred (or its equivalent in training or experience). Rank and salary will be determined by experience. Candidates should send resume and names of three referees to: Dr. Vera Alexander, Director, institute of Marine Science. University of Alaska, 99701. Closing Date March 15, 1983.

The University of Alaska is an EOAA Employer and Educational Inscintion.

Your application for employment with the U of A may be subject to public disclosure if you are selected as a finalist.

University of Albertz/Theoretical Geophysicist. Applications are invited for the positions of a Postdoctoral Fellow or Research Associate in the field of theoretical studies of direct and inverse. need of theoretical studies of direct and inverse problems in seismic wave propagation for complicated geological structures. The positions are available immediately and are initially for a one year period with the possible extension for a second year. The annual salary for the Postdoctoral Fellow position is in the \$17,000-\$19,500 range. The minimum annual salary for the Research Associate is \$24.000.

\$24,000. Interested applicants should submit a resume, a sommary of sesearch interests and arrange for direct letters of reference to reach
Dr. F. Hron or Dr. M. Razavy
Department of Physics
University of Alberta
Edmonton, Alta., TGG 2] 1

Canada from whom forther particulars can be obtained.

Send double-spaced manoscripts (four copies) to Eos, AGU, 2000 Florida Arenne, N.W., Wash-Ington, D.C. 20009, or send them directly to one of the associate editors with a copy to the above

Editori A. F. Spillians, Jr.; Associota Editoral Marcel Ackerman, Mary P. Amlerson, Peter M. Oell (News), Kevin C. Burke, Bruce Due, Rober H. Eather [History), Arnold L. Gordon, Gerard Lachapelle, Christopher T. Russell; News Wrlt-ers Barbara T. Richman; Editor's Assistants Sandra R. Marks; Eas Production Bisfit Patricia Bangert, Margaret W. Couelley, Eric Harrison, James Hebblethwaite, Hae Sung Khu, Vivian Nelson, Michael Schwartz.

Advertising that meets Al3U standards is accept ed. Contact Robin E. Linde, advertising coordicator, 202-102-0009.

Eos, Transactions, American Geophysical Union (ISSN 0090-3041) is published weekly by the American Ceophysical Union from 2000 Florida Avenue, N.W., Washington, D.C. 20009. Subscription price to members is included in annual dues (\$20.00 per year). Information on institutional subscriptions is available on request. This thonal sobscriptions is available on request. This usue \$5.00, Second-class postage paid at Washington, D.C., and at additional mailing offices.

Copyright 1985 by the American Geophysical Union, Material published in the issue may be photocopied by individual scientists for resenrel or classroom use. Permission is also granted to use short quotes and figures and tables for publication in scientific books and Journals. For permission for any other uses, contact AGU Publications Office, 2000 Florida Avenue, N.W., Washington, D.C. 20009.

the authors only and do not reflect official positions of the American Ceophysical Union unless Cover. Slushflows are a common, but

rarely observed, phenomenon in arctic and subarctic regions. The photograph shows the upper portion of a slushflow track in Atigun Pass, Central Brooks Range, Alaske. Approximately 30 such events have been observed in this area during the last four spring breakup periods. The slush, which is highly saturated and consequendy very dense, releases instantaneously in a manner similar to slab snow avalanthes. The combination of steep slopes, high-density material, and confinement within narrow alpine chutes produces flow rates estimated at several tens of metera per second. Evidence of su perelevation of the flow (approximately 10 m vertical) on the outside curve of the bend (left center in photo) implies it is in a supercrideal state. (Photo courtesy of Lawrence I. Onlati, associate professor. Department of Geography, Indiqua University.)

Chairman, Department of Geology/Louisiana State University. The Department of Geology, LSU, invites applications for the position of Professor and Chairman, to be filled during the 1983–84 academic year. We are seeking an earth scientist of national or international stature with research, academic, or industrial experience. The Department is a well-equipped, research-oriented organization with a laculity that should approach twenty by 1983. Construction of a new Geology Building annex is scheduled to begin within one year. LSU's location and strong tirs to industry make this position particularly attractive relative to the Department's growth potential.

y affactive relative to the Department's grown potential.

The successful candidate minst demonstrate musianding leadership ability. Applicants should submit to the Search Committee their curriculom vitae and a statement of their philosophy of governance. They should also arrange to have three letters of recommendation sent directly to the Search Contibute. Preference will be given to applications received by Febroary 15, 1989. Applications, nominations, and inquiries should be addressed to:

Clyde H. Moore

Chairman, Search Committee

Department of Geology

Louisiana State University

Baton Rouge, LA 70803

LSU is an equal opportunity/affirmative action

Department Head/Physica and Atmospheric Scianca, Drexel University. Drexel University seeks
an outstanding individual to be Head of the Department of Physics and Atmospheric Science beginning
Fall, 1983. Applicants should have extensive research/teaching experience and should have rlemonstrated appropriate leadership ability. The appointment is non-rotating and the successful applicant
will be concurrendy a Full Professor widt tetture.

Drexel is a private, technological University with
an enrollment of 10,000, most of whore participate
in a unique cooperative program. It is located in the

Drexel is a private, lectnological university whith an enrollment of 10,000, most of whore participate in a unique cooperative program. It is located in the West Philadelphia Commonity of University City, in close proximity to two other educational institutions and a major science center. The Department of Physics and Almosphenic Science has 80 faculty, plus an average of five visitors per year, and 40 graduate and 60 undergraduate anudents. There is significant research activity in three major areas: Experimental Physics (biophysics, nuclear physics, quantum optics, solar energy, solid state physics), Theoretical Physics (atomic and nuolecular physics, quantum optics, sulid state physics) and Almospheric Science (mesometeorology, remote sensing of the almosphere and satellite meteorology). Funding for these research activities exceeds one million dollars per year.

Screening of applicants will begin on March 15, 1983. Nominations or inquiries should be directed to:

to:
Dr. T. K. Lim, Chairperson
Departmental Head Search Committee
Department of Physics and Atmospheric Science
Drexel University
Philadelphia, PA 19104
(215) 895-2717
DREXEL UNIVERSITY IS AN EQUAL OPPOSTUNITY AND AFFISMATIVE ACTION EMPLOYER

Faculty Positions/University of Hawsit. Chemical Oceanographes/Marine Gordenast. The Department of Oceanography and the Hawaii Institute of Geophysics at the University of Hawaii hare a joint sup-ported, state finited, tenure track faculty position available at any level through full professor. Qualiphysics at the University of Flawaii hare a join supported, state funded, tenure track faculty position available at any level through full professor. Qualified applicants are being sought for this position with a 1983 starting date. Candidates with a strong teaching and research background with specialies in the area of stable sotope get themistry and marrine geochemistry are encouraged to apply, but all applicants in the area of chemical oceanography will be considered. The applicant will be expected to support graduate students, teach graduate courses, and obtain funding for research. The Department of Oceanography and the Hawaii Institute of Geophysics Building, and the Hawaii Institute of Geophysics Building. Twu nuclide Isotope radio mass spectrometers with computerized data reduction, micro inlet systems, triple collectors and carbonate, silicate, and sea-water extraction systems are available in addition to complete geochemical analytical facilities with electron microprobe, SEM-TEM, atomic absorption, X-ray fluorescence and diffraction, and organic geochemical lustrumentation. Applirants should possess a Ph.D. in oceanography or related earth science, and a statement describing research objectives should be sent to Dr. Fred Mackenzie, Chalrman, Search Committee, Department of Oceanography, University of Hawaii, Manon, 1000 Pope Road, Honolulu, Hawaii 96822. Closing date, March (1983.

Geological Oceanographen/Sehmentary Geochemist. The Department of Oceanography and the Hawaii Insiliute of Geophysica have a state-funded, tenure track faculty position available at any level through full professor in the fields of geological oceanographymarine geology-geochemistry, with 1983 starting date, Candidates with interests in tectonica, sedimentology, or geochemistry in marine systems with some experience in the Pacific Ocean region are especially enrouraged to apply. The Department of Oceanography and the Hawaii Insiliute of Geophysica have two research ships, an extensive core collection, and complete marine g

tal laboratories and sedimentological equipment, SEM-TEM, atomic absorption, X-ray fluorescence and diffraction, organic geochemical instrumentations. and diffraction, organic geochemical instrumentation and two large computers. The candidate will be
expected to supervise and support graduate studenta, teach graduate courses, and obtain funding
for research, Applicants should possess a Ph.D. in
geology, oceanography or related earth aclence, and
should have at least one year of research and teaching experience. A curriculum vita, names of three
references, and a statement describing research objectives should be sent to Dr. Stanley B. Margolts,
Department of Oceanography, University of Hawaii, Manoa, 1000 Pope Road, Honolulu, Hawall
96822. Closing date, March 1 1983:
We encourage applications from women and
roembers of minority groups. The University of Hawaii is an equal opportunity/affirmative acdon employer.

Faculty Position/Northwestern University. The Department of Geological Sciences is seeking a creative individual whose interests are compatible with the existing research strengths of the Department. These are in the areas of geophysica, tectonica, geochemistry, sedimentary geology, paleoclimintology. While area of specialization is open, candidates should have a strong compilizant to graduite in white area of specialization is open, candidates should have a strong commitment to graduate instruction and research. An appointment to a tenure track Assistant Professorahly is anticipated. Applicants should submit a resume and the names of three referees to:

B. J. Wood

Densition of Geological Sciences.

B. J. Wood Department of Geological Sciences (Northwestern University Evanation, IL 60201 312-492-3442 The closing date is February 18, 1983.

An equal opportunity employer.

THEORETICAL OR **EXPERIMENTAL SPACE PLASMA PHYSICISTS**

NASA-MARSHALL SPACE FLIGHT CENTER Huntsville, Alabama 35812

Two positions in theoretical or exparimental space plasma physics are available in the Magnetospheric Physics Branch of the Space Science Laboratory at NASA's Marshall Space Flight Center. Either theoretical or experimental backgrounds will be considered with a preference given to theoretically oriented researchera to complament the extensive experimental activities of the branch. The Magnetospharic Physics Branch is involved in the analysis of lowenergy plasma data from the ISEE, SCATHA, and Dynamics Explorar satallites, from sounding rockets, and from the Space Shuttle (STS-3). In addition, the group is presently carrying out the joint davelopment of a variety of activa spaca plasma axpariments that will be flown on Spacelab One, Two, and Six.

Salaries ranga from \$34,930 to \$41,277 per annum, dapending on experienca.

Interested applicants may contact Dr. Charles R. Chappell at the Marshall Space Flight Cantar (205-453-3036). Forward resumes to the following address not later than March 1, 1983:

NASA-Marshall Space Flight Center Space Science Laboratory Attn: Dr. Charles R. Chappell, ES51-R2 Huntsville, AL 35812

NASA

An Equal Opportunity Employer

U.S. Citizenship Requirad

Faculty Poaldana/University of Washington, Department of Geological Sciences. Position 1. The department seeks a geologist with demonstrated success in teaching introductory geology, whose primary responsibility would be to teach and coordinate Geological Sciences 101, a large lecture/lab course for non-majors. Rank of Lecturer or Assistant Professor depending on research experience and availability of funding. Beginning September 1989.

1989.

Position 2. Possible opening for geologist with strong quandialive, theoretical background as well as romnitiment to field related studies. We are particularly interested in the area of economic geochemistry. Successful candidate would be expected chemistry. Soucessful candidate would be expected to carry out a rigorous research program as well as to contribute to teaching responsibilities at both the undergraduate and graduate level. Assistant Professor (tenure-track) rank, beginning September 1989. Position 3. Electron microprobe specialist. This position is sopported at the 50% level by the department, and would require the auccessful applicant to provide up to 50% salary support from research grants or other smirces. This is a non-tenured faculty position at the rank of Research Assistant Professor. Candidates should have a record of successful grant-supported research in mineralogy/petrology involving use of the electron microprobe. The position requires supervision and operation of the microprobe facilities, and teaching one course. This position will be available after January 1983.

Applicants should send vita, letter of teaching and research interests, and names of four references to John B. Adams, Chairman, Department of Geological Sciences, A]-20, University of Washington, Seattle, Washington 98198 by 1 March 1983.

The University of Washington is an affirmative action/equal opportunity employer.

Hydrogeologist. The Department of Geology at Northern Illinois University has an opening for a senior, research oriented scientist to head a new wa-ter/environmental research group. The position is tenure-track at the rank of Associate or Full Profes-

The successful candidate will chair a search commlitee responsible for recruitment of additional, anticipated faculty in environmental and water-related sciences. This group, together with current faculty, will have primary responsibility for a Ph.D. program emphasizing geochemistry/hydrogeology/environmental sciences.

Available Indilities include a departmental computer (Harris 300), gas and solid-source mass spectrometer, atomic absorption, and a wide variety of geophysical equipment for both surface exploration and down-hole logging.

Please send resume and the names and addresses of three refarees to L.D. McGinnis, Dept. of Geology, Northern Illinois University, DeKaib, Illinois, 60115.

Northern Illinois University is an affirmative-ac-on/equal-opportunity employee

tion/equal-opportunity employer.

University of Washington/Meteorologist. Possible openiag for meteorologist with strong background in atmospheric turbulence, transfer processes, atmospheric physics, and experience in field oxportments. The successful candidnie would be expected to carry out an extensive research program, supervise graduate students, and leach course at both the undergraduate and graduate levels. Assistant Professor (tenure-track) rank, beginning September 1983. Possibility exists to hire at the Associate Professor level. A higher rank is possible for an exceptionally well qualified individual.

Applicants should send vita, letter of teaching and research interests, and names of four references to Joost A. Businger, Chairman, Department of Atmospheric Sciences, AK-40, University of Washington, Seattle, Washington 98196 by 1 March 1983.

The University of Washington is an affirmative action/equal opportunity employer.

Faculty Positions/Tha University of Iowa. The Drpariment of Physics and Astronomy anticipates one or two openings for tenure-track assistant professors or visiting professors of any rank in August 1988. Preference will be given to experimentalists in any area for the tenure-track positions. Corrent research interests include astronomy, atomic, condensed matter, elementary particle, laser, nuclear, plasma, and space physics. The positions intolic undergraduate and graduate teaching, guidance of research audents, and personal research. Interested persons should send a resumé and a statement of research interests, and have three letters of recommendation sent to Search Committer, Department of Physics and Astronomy, The University of Iowa, Iowa City, IA 52242.

The University of Iowa is an equal apportunity/affirmative action employer.

First Announcement Internetional Symposium on Deep Structure of The **Continental Crust: Resulte from** Reflection Selamology

The conference will be held during June 28, 27, 28, 1984, on the Cornell University campue in liheca, New York. The technical one will cover, amongel othere, the

-Resulte of selamic reliection profiling of the deep continental crust in countries throughout the world.

-Structure of orogenic beits. -Structure of continental rifts. ---Neture of the Moho. --- Mechanisms of conlinental accre-

--Siele-of-the-art techniques in deep seismic reflection profiling. A comprehensive proceedings of the conference will be published.

Steering Committee of the conference: --- Muawia Barazangi, Coordinator Department of Geological Sci-

> Cornell University Ithaca New York 14853 Telephone: (607) 256-6411 Telex No: 937478

—Albert Bally (Rice University) —Robert Hamilton (U.S. Geological Survey)

-Leonard Johnson (U.S. National Science Foundation) -Robert Phinney (Princeton Universi-

-Donald Turcotte (Cornell University) For additional information concerning sub-

mission of abstracts and/or to attend the conference please contact the Coordinetor, Participation may be limited.

医结合性免疫性

appropriate.
Inquiries ahould be made to: R. A. Phinney, chairman, at the above address, or by phone, (609) 452-4100. While later applications will be considered, we would like to have them by the 31a of Jaouary, 1985, or earlier, if possible. Applicants should submit: resume, names of at least three references, and a statement of research plans and priorities.

Princeton University is an equal opportunity affirmative action employer.

Poatdoctoral Resourch Associato Positions/Johns Hopkies University, Applied Physics Laboratory. Positions are available for studies of planetary magnetospheres, and for studies of earth magnetospheric and auroral physics. Selected candidates will participate in the anniyals and interpretation of data obtained from deep space protes (Voyager), or particle, field, and atmospheric emissions data from earth orbiting space-raft. Potitions are one year renewable upportunities with flexible starting dates. Applications should be addressed to Mr. Sievan F. Sayre, Department LER-258, The Johns Hopkins University, Applied Physics Laboratory, Johns Hopkins Road, Laurel, Mil 20707.

An Equal Oppurtunity Emphyser M/F. An Equal Opportunity Employer M/F.

Physical Oceanographer/Oregon State University, Assistant or Associate Professor, depending on experience. Applicants may be observationalists or theoreticiaus but must have a Ph.O. In the physical sciences, have demonstrated the ability to conduct independent high-quality research end are expected to obtain research funding. Duties include teaching and superrision of graduate students. Interested candidates should aubmit a resume and names of three references by I March 1985 to: G. Ross Heath, Dean, School of Oceanography, Oregon State University, Corvallis, OR 97321.

Affirmative Action/Equal Upportunity Employer.

The International Association of Hydrolog-

ical Sciences (IAHS) will participate in the

XVIII General Assembly of the International

Union of Geodesy and Geophysics (IUGG) in Hamburg, F.R.G., August 15-27, 1983. Here

is a list of the relevant symposia, their dates,

For additional details on arrangements or

on the union symposia, contact the chairman

of the local organizing committee, W. Zahel,

IUGG Hamburg Messe und Gongress GmbH, Congress Organization, Postfach 30 23 60, 2000 Hamburg 36, F.R.G. Additional infor-

mation on IAHS symposia or workshops may be obtained from the ronvenor or the IAHS

General Secretary, John C. Rodda, Institute of Hydrology, Wallingford, Oxon OX10

'Sea Ice Margins,' slated for August I8–I9, is the union symposium organized by IAHS. It is sponsored by IAHS (ICSI), the Interna-

tional Association for Physical Sciences of the

Ocean (IAPSO), and the International Associ-

ation of Meteorology and Atmospheric Physics (IAMAP). The convenor is Robin D.

Muench, senior research oceanographer, Science Applications, Inc., Suite 36, 13400 B

lar Regions' is sponsored by IUGG-8ureau

'Management of Earth Science Data,'

Northrup Way, Bellevue, WA 98005. There are five union symposia in which IAHS is participading. Geophysics of the Po-

<u>Meetinas</u>

Announcements

IAHS at IUGG

8BB. UK.

Physical Oceanography/Memorial University of Newfoundland. Applications are invited for a faculty appointment in physical oceanography which is to be made in the PHYSICS OEPARTMENT for June 1, 1983, subject to final budgetary approval. Rank and salary are negotable and commensurate with the qualifications of the appointee. Considerable research experience beyond a Ph.O. degree is preferred. The position offers a challenging academic career with stimulating research opportunities focussing in the Northwest Atlantic and the Canadian Arctic. The Department has an active group engaged in field studies of fjords in Newfoundland, Labrador and Saffin Island and the submarine canyons of the Grand Banks, and in the application of a numerical sealer model to the Labrador Sea and Baffin Bay. This group interacts closely with other oceanographers, both inside and outside the University, through the Newfoundland Institute for Cold Ocean Science.

Candidates are sought whose primary interests are in the seasting interests.

Cold Ocean Science.

Candidates are sought whose primary interests are in theoretical investigations of continental shelf and coastal dynamics but ours is a new and growing program and qualified individuals with experience in any area of physical oceanography should apply. An interest in interdisciplinary research and co-operation would be an asset. The appointment will include teaching duties at the graduate and undergraduate levels. Applications, including curriculum vitae and the names of three referees, or request for information should be addressed to:

Head. Oceaning the physics.

Head, Oepariment of Physics, Memorial University of Newfoundland, St. John's, Newfoundland, Canada, A1B 3X7.

A18 5X7.
Telephone: [709] 757-8758
In accordance with Canadian Immigration reguladons this advertisement is directed to Canadian citizens and landed immigrants in the first instance.

Earth Selences/Velversity of Leeds. Applications are invited for two positions available from 1 October 1985.

ber 1985.

The appointer to the Lecturiship in Chemical Oceanography or Sedimentary Geochemitry would preferably
have interest in interactions between sediments and
natural waters. Facilities exist for elemental and isotopic analyses of sea water and particulate matter.
The Department is also active in related areas of
sedimentality or desedimentality or de-

The Department is also active in related areas of sedimentology, isotope geology, sedimentary ore deposits, theoretical petrology and a range of analytical geochemistry.

The appointee to the Lecturship in Geophysics could have qualifications and interests in any branch of exploration geophysics or solid earth geophysics. Present activities in these areas include exploration seismology, global seismology and seismicity, palacomagnetism, tectonophysics, gravity and magnetics and electrical methods.

The Oepartment of Earth Sciences is an integrated geology-geochemistry-solidearth geophysics department teaching MSc in Geochemistry and Geophysics as well as undergradustes, and with a re-

physics as well as undergraduates, and with a re-

search school of \$0 + students.

Salary on the scale of £6375-£13,505 according to age, qualifications and experience.

Application forms (not essential) and further particulars may be obtained from the Registrar, University of Leeds, Leeds 1.82 9[7]. West Yorkshire, 118

Closing date 1 March 1983 (by telegram in the first instance if necessary for candidates outside the

Faculty Position in Oceanography/University of Miami. Applications are invited for a tenurentearning faculty appointment in physical occanography; level of appointment and salary continensurate with qualifications. Applications alimid have a retund of scholarly publications demonstrating the ability to interpret oceanographic observations, and acveral years experience in planning and execution of oceanographic field experiments. Dutles include teaching graduate level courses its physical oceanography and appervising research of graduate surtents. Send curriculum vitae, publication list analyments of three references to: Dr. Friedrich Schott, Chairman, Ovisium of Meteorology and Physical Oceanography, Rosensiel School of Alarine and Atmospheric Science, University of Miami, 4000 Rickenbacker Gauseway, Mlami, Florida 33149.

The University of Miami is an affirmative action/equal opportunity employer.

Iowa State University of Sciences/Faculty Positionone Applications are invited for a tenure-track faculty position in mineral resources. Rank is at the assistant or associate professor level, dependent upon qualifications. The auccessful applicant will be expected to develop a strong research and graduate student program in mineral resources/economic geology and will teach undergraduate and graduate courses in dis subject. An applied lield orientation is preferred.

is preferred.

Towa State has established a Mining and Mineral Resources Research Institute in order to anyport and develop research and education in indicial resources. An interdepartmental graduate minor in Mineral Resources has also been established. In addition to the appointment in the Oepartment of Earth Sciences, there will be full apportunities to interact with these programs.

Sciences, there will be tull opportunities to interace with these programs.

Completion of the Ph.O. prior to appointment is strongly preferred. In addition, research ability shown by other publications and/or postdoctoral or industrial experience will be an advantage. The position is currendy available and is expected to begin no later than September 1983. For application inferensition, please write to:

no later than september 1983, For application liformation, please write to:

Bert E. Nordlie, Chairman
Oepartment of Earth Sciences
253 Science I
Iowa State University
Ames, Iowa 50011
Iowa State University is an equal opportunity affirmative action employer.

STUDENT OPPORTUNITIES

Graduate Research Assistantiships Available/Department of Meteorology, South Oakota School of Mines and Technology, South Oakota School physics, to add the areas of minero al chord modeling, cloud physics, weather modulmanon, tadame transfer, tadar meteorology, and are political chemister and physics. Graduate study can lead to a Master of Science degree in Meteorology at SISMAST as well as a Ph.H. through a competative program with Colonade State University, University program with Colonade State University. University program with Colonade State University. University are acceptant of research emplayes included in modeling at the singless bond and increased level, including at the singless bond and increased level, including at the information, 21 design and evaluation of field experiments and operations in secular modification, increasigateure of thus derivation, 33 aircraft and radam increasigateure of thus derivation, 33 aircraft and radam investigateure of thus derivation, 33 aircraft and radam investigateure of thus derivation, 33 aircraft and radam investigateure of thus derivation and remote serving from satellites, 53 increase of thus derivative and source apportionment of annospheric particular manner employment generally is available. For further information contact fir. Briant 1. Davis, Acting Head, Department of Meteorology, South Rakota Schael of Mines and Technology, South Rakota Schael of Mines and Technology, South Rakota Schael of Mines and Technology, South Schael Schael of Mines and Technology.

Graduate Research and Teaching Assistantships in Marine Geochemistry. The Hawaii Institute of Geophysis sincites applications from students interested in M.S. and Ph.D. programs in narrise chemistry and geochemistry. Areas of research include narine organic and hungarin geochemistry, indopegoschemistry, sediment-seawaters organism interactions, sediment diagenesis, geochemistal cyling, and trupical seawater i fembury. Current supernic are \$147–576 per month for 10 or 12 month appointments. For further information, write:

Dr. R. E. Chave, Head Marine Google Marine Google physician

Marine Geochemistry Division Hawaii Institute of Geophysics 1000 Pope Rd. Hounlule, 111 96822.

SERVICES, SUPPLIES, COURSES, AND

Pure Mineral Crystals. Cint minimum, spec grade, purity guaranteed. Clicimes, garnets, pyrthe-lite, all others, worldwide, shipped on approval, Or-ders may require six months; pur-probe absolute— Jamary 30th and July 30th 1983. Roy Young, Carlin, Star Route, Nederland, CO 80466, 308-258-3846.

coupling with the troposphere and upper mesosphere will be discussed. Contributed papers on significant observational, theoretical,

and experimental results are solicited. Topics to be included in the symposium are modeling of the middle atmosphere, including the radiation budget; coupling between the stratosphere, mesosphere, and thermosphere; climatology of the middle atmosphere: gravity waves, turbulence, and parameterization of related transport in middle amosphere models; dynamics, including troposphere coupling; remote sensing; ultravio-let flux, photochemical processes, and related chemistry; electrodynamics of the middle atmosphere; trace species in the middle atmosphere; nocilucent clouds; and the physics and chemistry of ions and aerosols in the middle atmosphere. MAS is being jointly organized by the In-

ternational Association of Meteorology and Atmospheric Physics (IAMAP) and the International Association of Geomagnetism and Aeronomy (IAGA). It is cosponsored by SGOSTEP and COSPAR.

The deadline for submission of abstracts is March I, 1983. The abstract original should be sent to the secretary general of IAMAP, S. Ruttenberg, NGAR, P.O. Box 3000, Boulder, CO 80307. In addition, a copy of the abstract should be sent to each of the convenors: A. Ebel (IAMAP), Institute for Geophysics and Meteorology, University of Cologne, D-5000 Cologne 41, Federal Republic of Germany, and P. G. Simon (IAGA), Institute Il'Aérononie Spatiale, 3 Ave. Circulaire, B-1180 Bruxelles, Belgium. Detailed instructions about the abstract format are included in the second bulletin of the IAMAP General Assembly, which is available from S. Ruttenberg. and in the third bulletin of the XVIII IUGG General Assembly, which is available from the chairman of the local organizing committee, W. Zahel, Insitut für Meereskunde der Universität Hamburg, Heitnhuderatrasse 71. 2000 Hamburg 13, F.R.G.

Geophysical Year

The complete Geophysical Year last appeared in the December 21, 1982, Ens. A boldface meeting title indicates sponsor ship or cosponsorship by AGU.

Changes

Aug. 19-23, 1985 Sixth Gondwans Symposlumito be cosponsored by AGU.

Ahoy! Sail Back into **Baltimore** fon the 1983 AGU SPRING MEETING May 30 – June 3

Call for Papers

Abstracts must be received at the AGU of-

fice by 5:00 P.M. on March 9 to be on time.

Late abstracts (I) may be summarily rejected

y program chairman, (2) may not be pub-

ished in advance of the meeting, and (3) if

accepted, will be charged a \$25 late fee in ad-

The 1985 Spring Meeting of the American Geophysical Union will be held in Baltimore

from May 30-June 3 at the Baltimore Gon-

vention Center. Blocks of rooms are being

held at the Hilton, the Hyatt Regency, the

Holiday Inn, the Howard House, and the

dition to the regular publication charge.

committee or a House or Senate member, advising on a wide range

tae, and three letters of recommendation to AGU. For further details, write or call Mamber, Programs Division, Congressional Fellowship Program, American Geophysical Union, Florida Avenue, N.W.; Wash: Ington; D.C. 20009i (telephone) 462-6903 or 800-424-2488 outside the the Washington; D.C. area);
Deadline: Malan 37-4983;

Middle Atmosphere

A call for maners has been assed to eth joint IAMAITIAGA Symposium our Middle Atmusphere Sciences (MAS), to be held thating the XVIII Assembly of TUGG in Hamburg, F.R.G. Eleven half-day sessions, beginning on August 20, 1983, are planned for

The emphasis of the symposium program will be on the dynamics, energetics, and chemistry of the middle atmosphere, defined as the region from 10 to 120 km above the earth. Special problems included are electrodynamics of the middle atmosphere and the physics and chemistry of irms, aerosols, and methocent chanls. In addition, mutual bueractions of the middle armosphere regims nad

AGU Fellowship

public policy questions.

a broad background in science and be articulate, literate, flexible, and able to work well with people from diverse professional backgrounds. Prior experience in public policy is not necessary, although such expertence and/or a demonstrable interest in applying science to the solution of public problems is desirable.

The fellowship carries with it a stipend of up to \$27,000, plus travel alowance.

Interested candidates should submilt a letter of intent, a curriculum vi-

Abstracts may be rejected without consideration of their content if they are not received by the deadline or are not in the proper format. Abstracts may also be rejected if they contain material outside the scope of AGU activities or if they contain material already

published or presented elsewhere. Only one rontributed paper by the same first author will be considered for presentation; addition al papers (unless invited) will be automatically

Only AGU members may submit an abstract. The abstract of a nonmember must be accompanied by a membership application form (with payment), or it must be sponsnied by an AGU member.

There is a publication charge of \$40 (\$30 if prepaid) for each abstract. The publication charge is \$20 if the first author is a student. Both invited and contributed papers are subject in the publication charge. Prepayment of he publication charge can save money. Send a check for \$30 (\$15 for students) with your abstract. The abstract must be received at AGU by March 9 to avoid an additional \$25

charge. AGU will scknowledge receipt of all abstracts. Notification of acceptance and scheduling information will be mailed to corresponding authors in late April.

Abatracts

The abstract page is thirded into two parts: the abstract itself and the submittal information. Follow the instructions for both carefully. Please use a carbon ribbon to type the material, and do not exceed the maximum dimensions (11.8 cm by 18 cm) of the abstract. Abstracts that exceed the noted size limitations will be trimmed to ronform.

The meeting program will be prepared by photographing the abstracts exactly as they are received. Use the model abstract in prepare the final version, Submission of an abstract for an AGU meeting is presumed in carry with it permission for AGU to reprothice the abstract in all editions of Eos and in the programs and reports relating to the meeting. It is also presumed to permit the free copying of those papers. Although Eos is a copyrighted journal, authors are not requested to transfer ropyright. Copyright, where it exists, will be reserved by the au-

Submittal Information

Numbers refer to the items in the sulunittal block in the sample abstract. 1. Title of meeting.

2. Identification tonly members may submit an abstract; this includes invited authors): Type Identification number of one member author (ID number is the line consisting of four letters followed by the six digits; see members' mailing label on Eos or journals!, or il no author is an AGU member, type the ID number of the member sponsor (sponsor's name must also appear on the abstract at the end of the author portlon). If no 1D number is given, a membership application and dues payment must accompany the abstract. Gall AGU (800-424-2488 or 482-6908 if you are in the Washington, D.C., area) immediately

you need sit application.

3. Corresponding address: Give romplete address and phone number of author to whom all correspondence (acknowledgment and acceptance letters) should be sent. Abbre-

viate as much as possible. 4. Section of AGU to which abstract is submitted (use the following letter abbrevia-tions): A (Atmospheric Sciences); G (Geodesy); GP (Geomagnetism and Paleomagnetism); H (Hydrology); O (Oceanography); P (Planetology); S (Scismology); SA (Aeronomy); SM (Magnetospheric Physics); SG (Cosmology); SA (Cosmology); SA (Magnetospheric Physics); SG (Cosmology); SM (Magnetospheric Physics); SG (Cosmology); SA (Magnetospheric Physics); SG (Magnetos mic Rays); SS (Solar and Interplanetary Physics); T (Tectonophysics); V (Volcanology, Geochemistry, and Petrology); U (Union).

5. Type title of special session (if any) to

which submittal is made. 6. Indicate your preference for a particular

kind of presentation by one of the following letters: O, oral; P, poster. The chairman may assign you to either of these types of presentation in order to fit his program plan. 7. Percent of material previously presented or published, and where.

8. Billing information. (o) Complete billing address if other than the corresponding address (lient 3 abuve).

(b) If purchase order is to be issued, indi-

cate number upon submittal of abstract. Invoices returned to AGU because of insufficient billing information will be assessed an additional charge of \$10.00.
(c) If a student member is the first author,

the student publication rate is applicable. Indiente student rate applicable. (d) If prepaid, enter amount enclosed.

9. Indicate whether paper is G (contributed) or I (invited). If invited, list name of in-

Poster Sessions

A large, centrally located meeting room w be set up for poster presentations. Experience from recent AGU meetings and from of the author, can provide a superb opport search results. Hence, most sections of the linion will feature one or more poster sesslohs, and individual papers, if deemed sultable for this type of presentation, may be assigned to one of these sessions.

For actual size, see Eos, p. 1199, November 30, 1982.

Sample Abstract

Technique for the Preparation of Abstracts

F. R. B. T. AUTHOR (School of Oceanography, Hydro University, Watertown, Mass. (02172) a. C. N. D. AUTHOR (USGS, Woods Hole, Mass. 02543) (Sponsor: I. C. Alvin)

Follow this example in typing the abstract. The printing plates will be prepared by photographing the abstracts exceeding the maximum length (18 cm) or width (11.8 cm) will be cut to conform.

Use s good typewriter with a ribbon in good condition: A carton ribbon gives the best results. Please use type of about this size. Use 12 mitch. There will be a reduction of 50% for the printed abstract volume Follow these guidelines:

Type title in capital and lower case letters except where all capitals are standard. Underscore entire title.

(2) Leave one line blank after title.(3) Type names of authors in all capital letters, with affiliation and address in capits! and lower cass letters. Do not leave blank lines between euthors. (4) Underecore the name of author who will

present paper.
(5) If no author is an AGU member, type sponsor's name in capital and lower cass letters.

(6) Leave one blank line after author block (7) Neatly drawn in symbols or Greek 1sttsrs ere acceptabls. Use India ink. (8) Use SI units.

Presenters of poster papers are reminded that a poster exhibit requires careful prepara-tion. Figurex and text will be scrutinized in

cuss the contents of their papers in depth. Under these conditions, well-prepared fig-

ares and concise logical text are essential.

Merting Ubiliana 11, Frank Falen, NSF

Atmospheric Services (A) Rottald Lavole,

Hinhology (H) John R. Ritter, USGS Oceanography (O) John M. Bane, University

Planetology (P) Garle M. Pieters, Brown Uni-

smology (S) Emile Okal, Yale University

Physics (SS/SC) Miriam A. Forman, SUNY

Physics (SS/SC) Bruce T. Tsurutani, jpi

SPR Alaguetospherir Physics (SM) Michael Schulz, Aerospace Corp.
Tectovophysics (T) James T. Engelder, Lamont-Dollerty Geological Observatory Volcavology, Geochemistry and Petrology (V) Peter W. Lipman, USGS

Scholarship Assistance

for Minority Students in Earth,

Space, and Marine Science

The American Geophysical Union is

once again pleased to participate in the

American Geological Institute's Minority

Scholarship Assistance Program. Ap-

\$1500 are expected to be awarded for

Graduate or undergraduate students

Enrolled in, or applying to, an accred-

lled institution to study earth, space,

Black, Native American, or Hispanic

For a flyer for your student, call or write

Member Programs · American Geophys

Ical Union · 2000 Florida Ave., N.W. ·

Washington, D.C. 20009 · (202) 462-

Don Diego Gonzalez · Sandia Labora-

tories · P.O. Box 5800 · Organization 4731 · Albuquerque, NM 87115 (505)

मेनिनित क्रिक्स हिन्दिती।

Sidemary College

6903 or 800-424-2488 outside the

For applications, call or write:

students who are U.S. citizens

proximately 70 awards from \$500-

Eligible candidates are:

or marine science:

Washington, D.C. area

844-8849

with good academic records;

1983-1984

SPR Aeronomy (SA) Raymond G. Roble,

SPR Cosmic Rays and Solar and Interplanete

SPR Cosmic Roys and Solar and Interblone

Program Committee

of North Carolina

NOAA

NGAR

NOTE: Their are no special botton distributed for triping abstracts. You may true they form in notice producible into Please beave at least 4 cm between top edge of paper and abstract file. Type abstract as slow as possible to left edge of paper.

Submittal Information

Spring Meeting

AU09052536 ALVI(12548 (Sponsor) (a), Corresponding address e.C.N.O. Author

MS 123 Woods Hole, MA 02543

(b). Telephone number 617-548-1234

O (Oceanography) Special Cesnion: Deep-Sea Drilling (or none)

6. P (Poster)

10% at Midwest Meeting 8. (4). Hydro Univ. Admin. 61dg. Watertown, MA 02172

(b], P.O. #5684739 (c). Student rate applicable

(d). If prepaid enter amount enclosed. (P.O.'s requiring nvoicing are not eligible for discount rate)

9. C (Contributed) Abatract Ucadilne: Murch 9 Mall original and two copies to Spring Meeting

Amethory Grophynyd Uman 2000 Horda Arenne, N. W. Washington, D. C. 2000

Special Sessiona

El Chichon-The Stratospheric Cloud and Its New Observing Systems for Weather Predic-

Ocean-Atmosphere Climate Interaction in the Pacific (cosponsored by Oceanography)

Earth Rotation and Orientation: Results Solid Earth and Ocean Tides Geodesy (G) Demos C. Christothadidis, GSFC Detection and Interpretation of Crustal Gromaguetism and Palcomaguetism(GP) Patrick
T. Taylor, NASA/GSFC

Geomagnetism and Poleomognetism (GP)
Magsat Studies—Secular Variation, Main
Field Modeling, and External Fields (cosponsored by SPR-Magnetospheric Physics)

DSDF Hydraulic-Piston-Goring Program Detailed Nature of Magnetic-Field Reversals Magnetostrailgraphy of the Late Gretaceous— Early Terdary Boundary

Hydrology (H) Groundwater Flow and Fractured Rocks International Urban Hydrology National Urban Runoff Program Remote Sensing and Evapotranspiration Cauceled: Orinoco River

Oceanography (O)
Absolute Sea Surface Temperature Measurements From Satellites Gulf of Maine ond Georges Bank Goastal Boundary Layer of the Texas-Louisi-

Large-Scale, Low-Frequency Variability of the North Atlantic

Oceanography of Stralts Oceanography of the Norweglan-Greenland

Forcing Spaceborne SAR: Oceanographic Applica-

tions and Interpretations Investigations of Oceanic Processes Using

Visible Imagery Results From STACS

Sedlmentary Processes in Submarine Ganyous Marine Geology

Comparative Esd mates of Chemical Fluxes Across the Sediment-Water Injerface Experimental Estuarine Geochemistry

Marine Chemistry Ocean-Atmosphere Climatic Interactions in the Pacific (cosponspred by Atmospheric

and Volcanology; Geochemistry, and Pe-

Volcanology and Chemistry of the Earth's Interior (IAVGEI), and IAHS, will be held August 23-24. The IAHS occurrence is L. Al-foldl, National Water Authority, Fo 44-50, H-101) Budapest, Hungary, The symposium Coastal and Near-Shore

'Heat Flow and Geothermal Processes,' sponsored by the International Association of Seismology and Physics of the Foliab Inter-

or (IASPE1), the Internatibital Association of

ogy and Physics of the Earth's Interi-

and all associations. Mark Meier is the coconvenor. Detailed Information may be obtained from P. Melchlor, Observatoire Royal de Belgique. Avenue Circulaire 5, B-1180 Brussels, Belgium.

scheduled for August 16-17, is being spon-sored by the International Association of Geomagnetism and Aeronomy (IAGA), IGL, and all other associations. The IAH3 coconvenor is F. Buitot, Institute Royal Meteorologique, Avenue Circulaire 3, B-1180 Brussels, Belgium. 'Assessment of Natural Ilazards,' sponsored by IASPEI, IAVCEI, IAHS, and IAPSO (Tsunaini C), will be held August 16–19. The IAHS coconvenor is J. V. Sutcliffe, Institute of Hydrology, Maclean Building, Growmarsh Gifford, Walliogford, GB-Oxon OX10 88B,

Zone Processes' la divided into two sections: physical processes and chemical processes. The symposium on physical processes, to be held August 16-17, will be coronvened by Robert Beardsley, Woods Hole Oceanograph. ic Institution, Woods Hole, Mass, 02543. The chemical processes section of the symposium. to be held August 18, will be coconrened by C. Duinker, The Netherlands Institute of

Burg, Texel, Netherlands. The symposia are sponsored by IAPSO and IAHS. Another symposium of interest to IAHS is Polar Metcorology and Glimatology, to be held August 16-18. The IAHS representative is E. F. Roots, Department of the Environ-

ment, Ottawa KIA 0H3, Canada. Sponsors include IAMAP (IGPM) and SGAR. include IAMAP (IUPM) and SUAR.

There are five IAHS symposia. 'Hydrological Applications of Remote Sensing and Remote Data Transmission,' cosponsored by WMO and UNESCO, will be held August

Relation of Groundwater Quality, cosponsored by UNESCO, is stated for August 25—26. The convenor is F. Dunin, CSIRO Divi-

Effects of Agriculture and Forestry Practice, also cosponsored by UNESCO, will be held August 17-19. The convenor is R. Keller,

7500 Karlsruhe, F.R.G. UNESGO is cosponsoring the symposium.
'Dissolved Loads of Rivers and Surface Quantity/Quality Relationships,' to be held

Six IAHS workshops round out the IAHS participation in the IUGG general assembly. New Approaches in Water Balance Computations, to be held August 22-23, will be co-sponsored by UNESCO. The convenor is A.

venor is R, Keller, whose address is listed in the previous paragraph.

Glacier Mais Balance and Runoif will be held August 35. The convenor is V. Kotlynkov, Institut Geografi, Akademiya Nank.

SSSK. Moscow, USSR.

'Large-Scale Snow Studies' will be held Augusi 26. The convenor is A. Rango, Hyrlro-logical Sciences Branch, Code 929, Goddard Space Flight Genter, Greenbelt, Md. 20771.

The symposium iltled The Role of Hydrology in Water Resources Systems: Experiences and Perspectives for the Future' will be held August 25-26. It will be cosponsored by UNESGO. The convenor is E. Place, whose

address is listed above.

'Strategies for Hydrological Sciences in Developing Countries' will be held August 22—23. The ronvenor is N. B. Aylbotele, Water Sea Research, P.O. Box 59, 1790 AB Den Resources Research Institute (CSIR), I'.O. Box M32, Accra, Ghana.

Water Resources

The Fifth International Cunference on Fl-

nite Elements in Water Resources, to be held

at the University of Vermont in Burlington, June 18-22, 1984, will focus on mathematic

modeling of water resources, using modern numerical techniques. Because finite-element

methods have been shown to be a powerful

means for analyzing water resource prob-lems, the principal objectives of the confer-ence are to provide an exchange of experi-

ences in practical applications and to establish a forum for discussions about accuracy, econ-

omy, and the improvement and limitations of

the method. Other related methods also will

be within the scope of the conference.

Among the topics to be covered are

groundwater and seepage; tidal processes;

ocean dynamics; river flow problems; wave

modeling; fluid forces on structures; viscous flow; turbulence modeling; transport plie-

nomena; heat waste problems; seawater in-

trusion; water quality; environmental protec-

tion; meteorological dynamics; sedimentation

processes; parameter identification; calibra-

tion techniques; flow control; finite-element

numerical mathematics; software systems;

and software developments.

iniques; boundary-element techniques;

pre- and post-data processing; and hardware

Abstracts, not to exceed 300 words, should

be submitted by September 30, 1983. Gom-

pleted papers of those accepted for presenta-

tion will be due February I, 1984. For addi-

tional information about the conference or about the submission of abstracts, contact].

P. Laible, Fluite Element Gonference, Depart-

P. Laible, Finite Element Gonference, Department of Civil Engineering and Mechanical Engineering, University of Vermont, Burlington, VT 05405. Other members of the organizing compittee are C. A. Brebbia (University of Southampton, U.K.), W. G. Gray (Princeton University), and G. F. Pinder (Princeton University), Local organization is being handled by the College of Engineering and Mathematics and the Water Resources of Research Contents in the University of Versiton, University in the University of Versiton, Contents in

建

18-25. The convenor is A. I. Johnson, Wood-ward-Glyde Consultants, 2909 West 7th Avenue, Denver, Colo.

sion of Plant Industry, P.O. Box 1800, Gan-berra Gity, ACT 2601, Australia. 'Hydrology of Humid Tropical Regions with Particular Reference to the Hydrological

Geographisches Institut I, Albrecht-Ludwigs-Universität, 7800 Freiburg, F.R.G.
The symposium 'Scientific Procedures Apment of Water Resources Systems' will be held August 22-24. The convenor is E. Plate, Institut Wasserbau III, Universität Karlsruhe,

August 18-18, also is being cosponsored by UNESGO. The convenor is B. Webb, Department of Geography, University of Exeter, Amory Building, Rennes Drive, Exeter EX4

vno der Beken, Vrije Universiteit, Pleinlaan 2, 1050 Brussels, Belgium. 'Hydrological Aspects of Tropical Cy-dones,' to be cosponsored by WMO and UNESCO, will be held August 18. The con-

Congressional Science

The Individual selected will spend year on the staff of a congressional of scientific Issues as they periain to

Prospective applicants should have

Harbor Gity Inn for those attending. Housing and registration forms will be sent to corresponding authors. General Regulationa

other scientific societies has shown that a poster presentation, while more demandin nity for comprehensive discussions of re-

Atmospheric Sciences (A)

detail, and authors must be prepared to dis-

Geodesy (G)

Geological Interpretation of Long-Wavelength Magnetic Anomalies
Paleomagnetic-Stratigraphic Results Front

Physical Oceanography of the Gulf of Mexico and the Yucatan Straits Topographic Influences on Current Variabil-lty in the Western North Atlantic

Equatorial Dynamics

ponse of the Mixed Layer to Atmospheric

Paleooceanography
Physical/Geological Characteristics of Nearshore Suspended Sediments

Marine Sediments
Trace-Element Equilibria/Disequilibria Reactivity of Pollutants in Seawater,

Gosmic Ray Nuclides (cosponsored by Atmospheric Sciences; Geomagnetism and Paleomagnetism; Hydrology; SPR-Solar and Interplanetary Physics; SPR-Cosmic Rays;

Seismology (S)
*Seismicity and Volcanism: Active, Dormant, Interred (cosponsored by Volcanology, Geochemistry, and Petcology)

SPR-Aeronomy (SA) Incoherent Scatter Radar Studies of the Ionosphere and Atmosphere *Atmnspheric Electrical Environment (cosponsored by Atmospheric Sciences)

SPR-Cosmic Rays (SC) Application of Cosmic Ray-Produced Nuclides in Geophysics (cosponsored by Atmospheric Sciences; Geumagnetism and Paleomagnetism; Hydrology; Oceanography; and Vulcanology, Geochemistry, and Pe-

SPR-Magnetospheric Physics (SM) Numerical Simulation of Space Plasmas (oral and puster sessions)

Waves. Instabilities, and Turbulence in Space Plasmas (poster session) Aurora and Substorms (poster session) Magnetus pheric Currents and Fields (poster

*Geomagnetic Tall and Soundary Layer *Coordinated Data Analysis: CDAW-6 (oral and poster sessions) Special Call for Poster Papers on All Subjects

SPR-Solar and Interplanetary Physics (SS) MIID Turbulence in Space Solar Srismology

Tectonophysics (T)

*Geochemical Heterogeneities in the Mande: Implications on Mantle Convection (cosponsored by Volcanology, Geochemistry, and Petrology

Volcauology, Geochemistry, and Petrology (V) Chemical and Isotope Constraints on Andern Mngmatisni

Additional special session

Session Highlights

SPR-Atronomy (SA)

Atmospheric Electrical Environment. An allinvited session that will review lightning, cloud, and thunderstorm electricity and global and regional electrical processes. A contributeil sessinn on similar topics will also be scheduled (cospunsored by Armospheric Sci-

SPR-Counic Rays (SC)

Applications of Cosmic Ray-Produced Nuclides in Geophysica. This special session will focus on problems that can be addressed by measuring the amounts of cosmic ray-produced nuclides in various materials. Topics will include particulate transport in the atmosphere and oceans, the recycling of pelagic sediments, groundwater circulation, the relation between cosmogenic nuclides and climate. and the accumulation rates and ages of sedimeniary materials and ice. For further information write or telephone Miriam Forman, Department of Earth and Space Sciences, State University of New York, Stony Brook, NY 11794 (telephone: 516-246-8428), or Gregory Herzog, Department of Chemistry, Douglass College, Rutgers University, New Brunswick, NJ 08903. (Cosponsored by Atmospheric Sciences; Geomagetism and Pa-leogmagnetism; Hydrology; Oceanography; and Volcanology, Geochemistry, and Petrolo-

Tectonophysics (T)

Geochemical Heterogeneities in the Mantle: Implications on Mantle Convection. This session deals with the definition and possible causes of isotopic and geochemical lieterogeneities of the oceanic crust and related upper mantle and the constraints these may provide on hotspot provinces convection and flow patterns Cande, J-G. Schilling, and D. Turcotte.

Volcanology, Geochemistry, and Petrology (V)

Chemical and Isotopic Constraints on Andeau Magmatum. Presentations of petrologic and gets hemical evidence bearing on relative rules al continental crust, mantle, and subducted dab in the petrogenesis of the pluton-h and vulcanic rocks of the Amies. For further information contact the convenors: Barhara Barreiro, Department of Terrestrial Magnetism, Carnegie Institution of Washington, 5241 Broad Branch Road, Washington, D(: 20015 (telephone: 202-966-0863) and Russel S. Flarmon, Department of Geological Sciences, Southern Methodis University, Dal-

las, TX 75275 (telephone: 214-962-2730). Solubility and Transport Properties of Water in Silicate Mells. Discussions will include water cuntents in magmas, water solubility models, solubility and spectroscopic data on hydrous glasses and melts, effects of dissolved volutiles gasses and mens, enects of questived volumes on physical properties of melts, and water diffusion in melts and glasses. Further infor-mation may be obtained from the convenors: P. McMillan, Department of Chemistry, Art-

zona State University, Tempe, AZ 85287 (telephone: 602-965-5081) and E. Stoper, Division of Geological and Planetary Sciences. California Institute of Technology, Pasadena, CA 91125 (telephone: 213-356-6504).

Geochemical Heterogeneities in the Mantle-Imcations for Mantle Convection (cosponsored by Tectonophysics). Isotopie, geochemical, and geophysical heterogeneities of the oceanic crust and related upper manile and the constraints these may provide on hotspot provinces, convection, and flow patterns in the mande. Results from IPOD Leg 82 in the North Atlantic will be included. Further information is available from the convenors: S. C. Cande, Lamont-Dollerty Geological Observatory, Palisades, NY 10964 (telephone: 914-359-2900]; H. Bougault and J. G. Schilling, School of Oceanography, University of Rhode Island, Providence, RI 02908 (telephone: 401-792-6248), and D. L. Turcotte, Department of Geological Sciences, Cornell University, Ithaca, NY 14863 (telephone:

Meeting Report Alfred Wegener Conference

From August 28-31, 1982, the Alfred Wegener-Stiftung held its 1st Alfred Wegener Conference on 'Geophysical, Geochem-ical and Petrological Evidence on Deformation and Composition of the Continental Sub-crustal Lithosphere' at Seehein/F.R. Germany. It was convened by K. Fuchs (University of Karlsmille) and H. Wanke (Max-Planck-Institut Mainz).

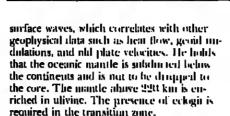
The main results and questions from this conference may be summarized as follows: Geophysical, petrological, and geochemical models of the earth's continental lithosphere have been refined recently so lar that they are no longer independent of one another. From an analysis of xenoliths the compositions proposed for this part of the earth were confronted with seismic velocities measured in sico at depth. Buth observations are nut compatible unless seismic anisotropy is present in the apper numtle. Triaxial anisotropy was also required in the asthenosphere from a world-wide inversion of surface wave data. Seismic anisotropy was recognized as a possible tracer of mantle cunvection. Whether it signifies a palcomotion or is generated by recent flow patterns depends on a number of material parameters that require future research in the field, in the laboratory, and in numerical modeling, e.g., experiments on stress relations at low strain rates, on seismic velocities and their partial derivatives at seismic frequencies under upper-mantle conditions, and on field experiments to map auisotropy in the mantle and lower crust. The conference showed that geophysical, petro-logical, and geochemical models can and

should be integrated, since they offer mutual constraints. Sessions were held on composition and structure of the earth's mantle, probing the continental subcrustal lithosphere for composition and physical properties, seismic anisot-ropy of the oceanic and the continental apper mantle, deformation at the crust-mantle soundary, and opper mande stress and strain. Thirty-six oral papers and five poster papers were presented. Sixty-one scientists atled from Australia, Austria, Canada, China, F.R. Germany, France, Japan, Switzer-land, United Kingdom, and United States of

Ringwood* investigated mechanical behavior and phase and density changes in subduc-tion zones and surrounding pyrolite mantle. The lower, ductile layer of the downgoing slab consists of slightly depleted pyrolite which is stripped off the slab and mixed with surrounding mantle, providing a source for midocean ridge basalts. The upper, cool, brittle layers of basalt and harzburgite undergo a significantly different series of phase transformations and therefore are denser in companson with surrounding mantle down to 50 km. At these depths, harzburgite becomes less dense than pyrolite, former basalt remains denser. This causes a nonuniform stress distribution, and the slab begins o buckle and accrete to large, cool 'megaliths.' Conductive thermal equilibration (1-2 b.y.) causes partlal melting of the former basalts (the restites slnk into the lower mantle) and contamination of the harzburgites. This fertile harzburgite can rise diapirically ami be responsible for the hot-spot valcanism of oceanic Islands or the updoming, rifting, and connected volcanism in continents.

D. L. Amlerson discussed the petrological model of the mantle from the seismological PREM model. He stressed the presence of ransverse isotropy to the asthenospheric low velocity zone decreasing with depth above the Lehmann discontinuity, with high velocities in the horizontal and low velocities in the vertical direction. There is clear evidence for lateral heterogenelties from multicoverage of

*A list of references to the various contributions is available on request from K. Fuchs, Geophysical Institute, University, Herizstrasse 18, D-7500 Karlsruhe 21, P.R. Germany.



Hofmann pointed out a major problem in basalt genesis models derived from isotropic constraints. Nd and St isotopes require highly depleted (in incompatible elements) sources for midocean ridge basalts and less in minutepleted reservoirs for oceanic island basalts. Pla isotopes require enriched (in incompanible elements) reservoirs for all these basalts. Carrently, two major models are proposed to solve this problem: (a) mantle depletion and mande metasomatic events where the timing of the processes and the evidence from altramatic inclusions (mantle material) are still not very clear; (b) recycling of oceanic crust into the mantle, whereby mixing with depleted and numdepleted mantle material may cause

the whole spectrum of basaltic types. Wanke pointed out that sindies on therzobte nodules revealed the existence of primitive reservoirs in the upper mantle, having almost chondritic abundance ratios of all 56 refractory lithophile elements except for the most incompatible ones and being almost identical to pyrolite in its major element composition. This fittding speaks against largescale fractionation of the mantle as a whole.

Spolin pointed ant difficulties in numerically modeled mantle convertion where the lower mantle convects separately from the

Allegre demonstrated the use of natural isotropic tracers (Sr. Nal. 19, 11e) to study the evolution of the manule. Most of the manule was depleted. Two processes are possible: (a) depletion of the mantle by extraction of basalts (This would effect the major and trace elements in the mantle, and a large mass exchange between mantle and crust must be posudated.); (b) depletion of the manth by extraction of granites. Mainly, tracer rlements of the mantle are affected. Major arguments for this are the isotropic initials of archean granites close to the isotopic evolution of the mantle and the complementary tracecelement characteristics from gradites to the

ilepleteri reservair. He repurted 'two-point Sr isuchrones' from garnettherzulite nortules as evidence for accretion of the continental lithusphere from 2.5 b.y. on. The older arcreted lithosphere is less depleted than the younger and deeper

Jordan provided evidence from 15 amb PKP-travel time anomalies that downgoing slabs continue to depths greater than 650 kmc, possibly down to 900—1000 km. This contradicts Ringwood's model. Jordan reviewed his model of the roots of the continents that are depleted in basaltic constituents and are therefore lighter, with higher seismic velocities, than the oceanic mande. The lighter densities of the continental mantle are uffset by cooler temperatures. Because of its reliactory nature, part of the continental mantle omes a stable geochemical reservoir with widespread metasoniatism that has been inpregnated by large-ion lithophile elements ng fcom the deep mantle , causing hig heat production and contributing significant ly to the surface heat flux. According to Nicolas, the oceanic and the continental mantle show similar depletions to a depth of 80 km, below 80 km the continental mantle is more

Kurat produced possible evidence for mantle metasomatism from two different cock types: (a) A volcanic rock from Siberia juneimechite-similar to kimberlites in major elements) has a high content of incompatible elements (especially light rare earths) together with a high content of compatible elements cially Ni). This suggests a source formerdepleted by a partial melting event and later enriched by a metasomatizing fluid. (b) Hornblende-bearing lherzobies within H2Ofree spinel and plagioclase therzolites and harzburgites from Zabargad Island in the Red Sea are considered to be the result of r-mantle metasomatism

Seck discussed the upper-manule cooling history in deformed porphyrodattle spinel peridottes from the West Eifel. They contain large (up to 8 mm) orthopyroxenes with exsolved clinopyroxenes and spinels in their center. Original core compositions (before ex-solution) were obtained with a defocused mi-

croprobe beam. Temperatures obtained from the reconstructed cores reach 1100°C, whereas tim temperatures are around sinte:

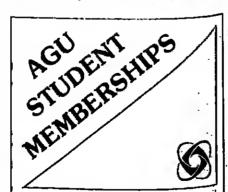
Wedepohl suggested that tertiary basale

tranging in composition from quarte dude ites to olivine incliffines) from the lower Saw ny, morth of Vogelsherg, are derived by partial melting of spinel therzolite formerly depleted in basidic component and later curiclied to incompatible elements. Evidence is the relactory matrice of the ultramaticinclasions 174 vol.; offviner, their chemistry, the high contents of incompatible elemens in the basalts, and the behavior of the heavy rate earth elements in these rocks.

Dawson distinguished between two types of metasumatism in mande-densed ultramafic undules: (a) parent metasomatism where tomral evidence shows that primary phases at replaced by later hydrous phases (amphible and/or philogophe) (This type of metasomatism seems to mirror the composition of dehost igacous cocks.1; of cryptic metasonnum. which is less obvious and is only recognized by the last that ultramatic nodules depleted in basako components ti.e., in CALABO. NagO. . . .) are critic hert in incompatible dements such as K. Ph. U. and light rare each clements. This curic hugent appears to be quite old (1.5-2 b.s.), while the patentitles-SOMACISTO Appears to be a presumor to volcan ir activity.

St. Mueller discussed the topography of the lithosphere-astherosphere boundary in berope, which is determined from a regionalization of surface waves. Features at depth are not always identical with surface features. r.g., the Rhinegraben extends well into dr Alps. Another important phenomenon is desubduction of lithosphere into the mandele low the axis of the Alps. Reviews of deep@s time somithing of the upper mainleanding range profiles were given by Ausorge, Milla Prodelil, and Zeng-Rongsheng. From various parts of the world, fine structures and anusally high velocities were reported.

The session on anisotropy in the mante was opened by D. L. Andersia, who present ed evidence for anisotropy from a large set of travel time residuals. In the analysis of surface waves the direction of the fast axis was allowed to vary in correspondence with downgoing at trem hes, upgeing at raiges, and horizontal at oceanic bashts. For Rayley wave periods of 15th sathermathents do not show up, Justend, there is a correlation with genial condulations: lows have maximum selsune velocities, and highest heat flow correlates with slow regions. For 25th s there is no correlation with the groud. The type of an isotropy seems to be a function of age of the oceanic lithosphere. An anisotropy inversion



Available to students enrolled in al east a half-time study program leading to a degree in any of the geophysical sciences.

■Only \$7.00. Special low rates on AGU primary ournals.

Reduced meeting registration fees. EOS is included free with member

Full membership privileges including the right to yote and hold office. Call toll free and ask for an application for yourself, your col-

■30% discount on AGU books

league, or your student(s). 800-424-2488 462-6903 in the

Washington, D.C. area.

thins the oceanic lithosphere that is in better agreement with seamount loading.

Shimammra reported latest results from ocean-bottom seismology in the Pacific ocean near Japan. There are now several profiles with a length of 1200 km cuvering various azinuiths. At a depth between 50 and 100 km die velocities change with azimuth between 7.6 and 8.8 km/s. Since the fast direction is perpendicular to the magnetic lineations, but he plate moves obliquely to them, it is concluded that the deeper oceanic lithosphere remembers the original direction of spreading for at least 40 m.y., i.e., the observed anisotropy is a fcozen-in feature. A future prob-lem is to obtain higher resolution in the anisotropy depth distribution.

Jacoby reported on lithusphere-aschenosphere structure from group velocity analysis of Rayleigh waves parallel to the Island-Reykianes ridge, showing the thickening of the ithosphere with age.

A special discussion meeting on the seismological differences of the oceanic and continental lidiosphere was arranged in which forden and D. L. Anderson served as key speakers. While there was consent about her erogeneities above 200 km, there was thisagreement about continental roots below 200 km (Jordan), which Anderson could not see. The discussion merged into a petcological argument on the presence (Anderson) and abseoce [Ringwood) of eclogite above the 650-

The session on anisotcopy in the continental subcrustal lithosphere started with a critical review by Jackson of the work done in Australia on anisotropy at the 200-km discontinuity. The main evidence comes from observed seismic velocities exceeding those predicted from petrological models of the mantle. To verify the presence of anisotropy, Jackson asked not only for seismic observations in other azimuths but for refined determinations of elastic constants at seismic frequencies and relevant P.T. conditions. Fuchs compared musually high seismic velocities in southern Germany with velocities derived

fcom a suit of petrological mutels derived from local xenoliths. He concluded that only an anisotropy in the mande increasing with depth is compatible with both seismic and perrological observations. While the mantle immediately below the crist-mantle boundary composition, it becomes strongly depleted already within the first 10 km. The alignment of the olivine crystals is compatible with the orientation of the present crustal shear stress field. Nicolas discussed the various mechanisms for the formation of preferred orientation of olivine. Thirty percent strain seems sufficient to prodine anisotropy. The fahric axis will always currelate with the flow mientation. He reponed on fabrics experiments un syndietic rucks. Harzburgite seems to develop larger anisotropy than peridotite. It appears that de-pleted materials have a lower viscosity than unilepleted, or that the flow will concentrate in harzburgite. Hirn reported on new deepseismic sounding results from Tibet. Pn veloc ities of 8.6 km/s were observed on reversed E-W profiles at a depth of about 70 km, correspunding to 8.7 km/s at surface temperature-pressure conditions. This fast velocity was recorded perpendicular to the motion of India. Prodehl provided a review of anisotropy analysis for the continental mantle and presented a comprehensive collection of P velocity-depth distributions for the mainle with the typical fine structure and increased veloc-

ity values obtained by deep-seismic somuling on long-range profiles. In the session on deformation at the crustmantle houndary, Christensen reported on deformation and associated anisotropy near the oceanic and continental Moho from field experiments at ophiolics in Oman and other places. They were supported by laboratory studies of the anisotropy in rock samples. Granulites of the lower crust are also likely candidates for anisotropy by preferred orien-

tation of plagioclase and anorthosite. Oliver presented evidence for deep-reaching thrust zones from COCORP deen reflection work and argued for a worldwide effort to illuminate deep structures by continuous reflection profiling. In deep reflection work the Moho does not aeem in he the same discontinuity everywhere. Behr discussed nape tectonics in the Variscian mountain system with models of stretching of the lower crust and decoupling of lower crust from upper mantle by instrusion of asthenolites. A step in the Moho in northern Scotland, and lateral heterogeneities in the structure of the subcrustal lithosphere deduced from refraction seismic experiments, were presented by Faher. Giese argued for an overthrust geology reaching into the upper mantle supported by refraction seismic data with examples from

and the Alps. The last session on upper-mantle stress and strain was devoted to dynamic modeling and state of temperature of the continental mantle. Froidevaux modeled the dynamics of mass heterogeneities and lithosphere deformation. The spreading of continents and especially uf mountains is prevented by high density roots that set continents and mountains into compression. The compressive stress regime in mountains may reverse if the dense root becomes detached. The thermal state of the lithosphere was discussed by Chapman. Physical parameters and processes of the lithosphere are governed by the temperacure field. He presented evidence for an increased average global heat flow value of 80 m W/m² if convection contribution of young oceanic lithosphere is taken into account, and he discussed geotherms for static, dynamic steady state, and transient states. There followed short contributions by Janpart on thermal congast of the thickness of the lithosphere; Spohn on lithosphere thinning caosed by convective instability: Jacuby on convection models with two-dimensional viscosity discribitions (plate motions are highly dependent on alcompling); Neugebauer on numerical modeling of anisotropy and shear

the USSR, Southern Italy, the Apennines,

of the measurement of plate kinematic parameters from laser satellite interferometry with emphasis on the station network planned for the Mediterranean. A precision of 5 cns is foreseen in 5 years.

K. Fuchs is with the Grophysical Institute of Karlszulie University, Karlszulie, Fed. Rep. Germany. H. Wanke is with the Max-Planck Institute for Chemistry, Department of Cosmochemistry, Mainz, Fed. Rep. Germany.

List of Participants

C. J. Allegre, Paris; E. Althaus, Karlsruhe; D. L. Anderson, Pasadena; J. Ansorge, Züneh; H. J. Behr, Göttingen; P. Blümling, Karlsruhe; G. Brey, Mainz; P. Burek, Mainz; D. S. Chapman, Salt Lake City; N. Christensen, Seattle; H. Closs, Hannover; J. B. Dawson, Sheffield; S. Faber, Erlangen; C. Froidevaux, Orsay; K. Fuchs, Karlsruhe; K. von Gehlen, Frankfurt; P. Giese, Berlin; F. Goerlich, Bonn: Ch. Göpel, Paris; M. Grünewald, Karlsruhe: A. Haas, Karlsruhe; Z. Hajnal, Saskatoon; H. Häge, Karlsruhe; M. Hauck, Karlsruhe; A. Hiris, Paris; A. W. Hofmann, Mainz; P. Hubral, Hannover; I. Jackson, Canberra; W. R. Jacoby, Frankfuri; E. Jagottz, Maiuz; C. Jaupart, Paris; Th. H. Jordan, La Jolla; G. Kurat, Wien; G. Leusch, Saarbrücken; K. Mengel, Göttingen; H. Miller, München; St. Mueller, Zürich; W. Müller, Darmstadt; H.-J. Neogebauer, Claussthal-Zellerfeld; A. Nicolas, Names; J Oliver, Ithacn; H. Paline, Mainz; C. Prodelil, Karlsruhe; H. Puchelt, Karlsruhe; Ch. Reigber, München; C.-D. Reuther, Karlsruhe; A. E. Ringwood, Canberra; Rongsheng-Zeng, Beijing; M. Rosenhauer, Frankfurt; G. Sattel, Karlsruhe; H. V. Schmincke, Buchum; H. Seck, Köln; H. Shimanura, Sapporo: H. Sienies, Anchen; T. Spohu, Frankfint; R. Stangl, Karlsruhe; H. Wänke, Mainz; J. Walther, Karlsruhe; K. H. Weilepohl, Gottingen; H. Wilhelm, Karlsruhe; G. Wörner, Bochum.

Separates

To Order: The order number can be found as the end of each abstract; use all digits when ordering. Only papers with order numbers are available from At.U. Cost: \$3.50 for the first article and \$1.00 for each adulitional article in the same order. Payment must accompany order. Deposit accounts available

Seud your order to: American Geophysical Union 2000 Florida Avenue, N.W. Washingtun, D.C. 20009

Aeronomy

0430 Composition

O410 Absorption and scottering of tablation injecticies)
MEASUSEMENT OP STRATORPHESIC AFBOSOL NUAB SANRIKU [13°N, 147°8) in laPAN ON MAY 31, 1978
A. Matsucaki line institute of Space and Astonastical Science, Komeba, Heguce, Tokyo 153, Japan), Y. Nalsoura, T. itch
The sitlinde profile of the acattoring extinction of atratospharit secose) a was measured by using the balloon-become spactometer with the solar accaltation esthed note Sastilu [19°N, 142°8) in Japan on May 31, 1970. The spattomator was based on multichannel spactomator was based on multichannel spactomator was based on sorting and the spattomator. The coult conficuad that the ecrosol concentration was principally "background lavai". The solit conficient turns out to be close to that of the SAM 11 cetauroment near Alaska during July 16-19, 1979. [atratosphoric secosol, assistering articeton, belloon-bores mas-18 spectromessa.). 0410 Absorption and acestering of cadlation J. Geophys. Res., Green, Paper 201936

O410 Cosposition

SIMULTARROUS MAISUREMENTS OF VERTICAL DISTRIBUTIONS
OF STRANGERERO NO, AND O, AT DIFFERENT PERIODS OF
THE HIGHT
F. Rigand (Station Scientiflows du Val Jaysux,
F. 78450 Villayreum; J.P. Bandst and D. Ruguenin,
Risultaneous seasurements of Ro, and O, wars perfored al diffurent periods of the night from elveto spheric believes intuched from the OFES balloon
station at Airs-sur-lideour in September 1950 and
September 1981, The superimental NO, version prefiles compare feverably with those From photochemical theory, Difference can be explained by the
dependance of the recombination was affing and O;
upon attitude. The O; concentrations above 10 km.
essured by specific periodic season below 10 km.
essured by specific season presents oblations by seams of this lacknings could be used as
a scarrence for the detection of long-term variations of O; (Filtreges trioxids, some; straiosphera).
J. Scaphys, Heav. Oran Propor Act 22.

J. Geophym, Hem., Orem, Paper 701762

NEASYRGATE OF RETAINER FT(0) 534 % EXISION IN THE VEILIGHT THEMBOSPHER D. 9. TOPE (Confer for Atmospheric and Epones Sciences, Unda State University, 1965-41, iogan, Stah Salz2), Wedd A. Abdou, M. S. Tore, S. G. Burneide, and J. W. Her breaker, Jr. Heasurements of the 554 % existing which arises from the transition of 19-10) uses made at Sucherland, South Africa, in the summer of 1977. The twilight variations show a testid decay at samest from > 10% to 12 followed by a parasesent unication at ~-12 into the vary into twilight we identify the methy critishe cariation as being produced animly by phorodisspeciative ionization of My and extincts a breaking ratio 8 % of for the production test of 1 to the 140) waste. We conclude that alectron quanching is the gain idea process with on sericated value of ~ 107 may st for its rots coefficient, k. (These untingtess are based on a measurement of the ratio 1/3 which we found to be

 $\sim 10^{-6}$.) Upper limits of 5 x 10⁻¹² cm³ s⁻¹ and 1 x 10⁻¹¹ cm³ s⁻¹ are estimated for the quenching rate coefficience by both 0 and 0 respectively. The emission is the late twilight is savetbed to galactic J. Geophys. Res., Blue, Paper 2x1923

04)0 Beronomy (Molecular Composition)
FIRST INFRARED REASUREMENT OF ATMOSPREESC FO

FIRST INFRARED READUREMENT OF MARKET THE COUNTY FROM THE COUNT 91405 Orany Cedax, Yrancai J.-M. Ylaud, J. isurent and G.M. Etobas Bigh resolution Fourlar Transform spectra of the ethosphace in the 2530-7930 cm⁻¹ rogion have been recorded from the ground using the sun as a source. For the lirst time, many NO2 sheorptice posts belonging to the vy * vy beed and its associated hot beed vy * vy * v3 * vy have been located. Among them, I) well believed fastures have been used to determine MO2 vertical column deceils as. Ledend, from the scaling of 4 spectra tacorded at air masses of 10.7, 3.4, 1.1 and 10.5, that is for the 1 lirst ones just after sumples and in the early mothing and for the last one sunries and in the early motning and for the last one ust before summat, vertical column demetries of 1.84 t 0.34, 1.80 t 0.78, 1.74 ± 0.44 and 3.74 t 0.46 ssveral lines having a wide enough range of intension of loset state energy lovels. Historical atmos-pheric spectus, ground based oeasurament, nitrogen dicaldo).

Occubys. Res. Lett., Paper 2L1906

0450 Presence, density, and temperature INITIAL TESTS OF AS UNDER RASED ON AL VALUES FOR HODELING MAGNETIC STORM RELATED PERTURBATIONS OF THEMOSPERES J. S. Himbot, G. Stehlm and S. Sloulac (Bloctries)

Laboratory, University Park, Fennsylvanis, 16802)
Very large patturbations in the thermosphere and innephere are induced by mations drives by heating and by sletting fields) in the surocal electrojer regions. Winds certy these sfetts to all initudes. Becames of this, thermosphetic models have necessed associated with negacic motivity. The Rp and Ap (edices have usually been amployed; however, these are poerly converlated with the temporal variations. Initial experiments are described with new indices neitivity that are nor directly related to the secrety driving functions. The new indices are heardy driving functions. The new indices are heardy driving functions. The new indices are heard on the immensibility driving functions. The new indices are heard on the immensibility of the case of the survey laboratories indices over a period within the on instances are heard or high latitude about oxygen dessitias under disturbed conditions. Conclusions are drawn on the problems and premise of the suprosch. und premise of the approach. Geombyn, Res., Bios, Paper 24(98)

Electromagnetics

0799 Misgellessons (Radlo Loss)a Porsota) RADIO LOSS IN FORESTR UNING A MODEL WITH POUR LAYERED MEDIA

G. P. dos R. Cavelosote, D. A. Rogers and A. J. Ciercle (Riestrical Engineering Department, YEC, UNICAMP, P. O. Box 1170, 15100 Compines, 2P, Brasii)

A model with four layered medle is devaloped for the calculation of the radio loss is forsets. Is this modet two lossy dielectric leyers pieced over a conducting flet earth are used to represent the crows and the trunk of the trees. Symdio Orean's functions is their eigenfunction expansion forms are used to seelywe this model sed the lectromagnatic flalds are obtained from these functions, The theoretical results of the radio loss for vertical and horiscetal radiating dipoles and for typical Corests egree with the aveilable experimental deto. For this comparison the parameters for the isyar representing the grown of the tross were set Lasted were setimated. | Redio loss, forests, four layered media) Red. Sci., Puper 251812

Geochemistry

heating the sees higher shear heating and re-

bones). Finally, Reigher reviewed the accuracy

lated anisotropy developing in the root

1410 Chemistry of the atmosphere
THE CONTRIBUTION OF VOLCANORS TO THE GLOBAL ATMOSPHERIC
SULFUR BUNGES

8. Berresheiz 'Conter for thy/rommental Protection,
University of Frankfurt, Robert-Reyer-Str. 11, N-6000
FrankfurtH., FRO), and M. Jaseonke
A new assessment of the global volcanic emission rates
of M_{2*}, 102 and 3042° to presented. Fas essessment is
beased on the development of a sutradio colsentification of
volcanic activity end its application to commeasuraments and measuring data given in the literature,
Using this classification, the volcanic sulfur release
(a satisated to 1.8 x 10° t 5% total. This estimate
most be regarded as a minimose alone the data stallable
for major explicative events are very uncestaln. On the
other hand the frequency of sach events is comparatively
ion. We estimate a global volcanic scissing of 1.52 x 10°
t 50/x for the pariod 1961-1979. Our calculations show
that in that period the total 50; release during cruptive
socivities was at least 1.0 x 10° t 50/x, were estited
during non-acuptive solivitics. The importance of the
contribution of the con-staptive solivity has bee
neglected in agriler seasesments. The average values for
the signal volcanic H.S and 502° access strength are contribution of the con-staptive solivity has been onglected in serial seasosments. The average reduces for the global volcacio H₂S and SO₂²⁻ scarce atrength are found to be around 10⁵ (**a sed 10⁷ t**e, teapportvely, **e conclude that during a period of vary intensive volcanic activity around toe world, like that which recently has started with the eruptions of Soufrière in 1979 and KC. Et Esteen in 1980, the global sulfur release during aruptive evants say hences up to one order of angultude aligner than we have naisou(and but that nevertheless the sulfur estamted dating toe non-aruptive activity is doninating.
[Class) Treation of volcanic sottvity, volcanic sulfur soles(on, atrosphatic sulfur budget)

1. Geophys. Res. (Sees. Paper 2019)

J. Geophys. Res., Green, Paper 2019)1

isotupe Geochister of the Arabia Main: A sponsalz-BARCE
A. Louginalli (Institute di Minerelegia, Patrografia e Geochisice, University of Palerme, Palerme, Jealy) On the transmits of the Ameson Rivar ands by the Alpha HELTI to 1976 and 1977 on extensive sults of samples was sollarced for instojic analysms. The water isotopoe [10] 10,0/8) were determined in atmospheric vater vapour and in civer, rain and leaf outers. 130/ 10 ratios wate measured in the dignolved and atmo-spheric CO₂. Determientions were made of ¹⁸8/¹⁸ med oxygen lactopas to dispolved subphate. The effect of 'continuotality' on the water incomes is minor raflecting the irrae scale tacycling by dispo-transpiration from the huge area of foract within the besid. Variations in the isotopic shundants hetween

1976 (June-July, dry meason) sed 1977 Chev-June, wed o

The isotopic composition of the CD, hoth accomposition and dissolved, if declinated by biological effects. In 1976 the dissolved CQ; showed Journatroan variations from -14°/so at Iquiton in Peru to -22°/co in the lower reaches. In 1977 to systematic trend was apparent, the deta ranging around -19°/so. The values for amospharic CO₃ decrease inland from marino values at the mouth to around -13°/so at Hamaus. Forfun the dry essance (1976) the values in the interfor, western hasis were bosogonous at -20°/so. In the vot season chare were considerable veriations reflecting amospharic lastabilities with the awarege value being about -13°/so.

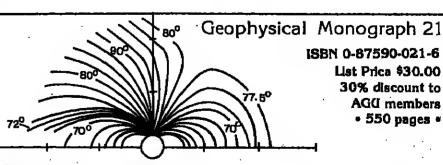
The elliphur feotopic composition of the dissolved multiphate le remarkably uniform at sround 7°/so. In 1977 the "O values in the sulphate decreased systematically downstream from 50°/so in Yeru to T°/so at the mouth consistent with a progressive, redox mediated exchange with a weat and dissolved orygen. In 1977 the values increased to over 11°/so apparently indicating exchange with a tight) frectionated reservoir of dissolved oxygen pechaps in the sm(-teducing environment of the flood plate lakes.

J. Geophys. Res., Green, Yapar 201542

. Coophys. Res., Green, Yaper 20154:

1499 General [infrured Propartice]
ASSOLUTE BANS STRENGTHS OF RALOCARBONS F-11 AND F-12 IS
THE R-15 µm REGION
9. H. Kagann, J. N. Eikins (Gas and Pactical-ce Science
Rivision, Halionui Bucaus of Standards, Mushington, DC
20214] und R. L. Sams
The infrared strengths of three vibrational band systems of halocarbose F-11 (CCLsF) and four vibrational
hand systems of halocarbose F-12 (CCLsF) were measured
at 298 ± 1% using a Fourier transform leftared spactrometer. Those results were obtalaged at a maximum instrumental cusolution of 0.06 cm⁻¹ which utlowed a direct
dutarminulion of the based utrengths. The results for strumental cusolution of 0.06 cm² which ullowed a direct duterminution of the bend utrengthu. The results for the band strengthy of f-11 were 1828 to 57, 59.4 to 2.5, und 679 ± 27 cm² utm² for the bund systems centured ut 846, 813, and 1085 cm², respectively. The strengthu for the principul band systems of f-12, were 1448 ± 58, 1181 ± 48, 1147 ± 48, and 777 ut 31 for observed bund centere ut 918, 923, Lt02, and 1881 cm², respectively. A discussion for preventing and considering possible urrors for this direct method was presented. Our measurements of the total infrared band strengths for f-11 und f-12 would indicate approximately 175 und 5% greater strengthausid is recent greenhouse warming calculations, and toneogeneity, a corresponding lacresse is the possible utmospheric warming affect. (Soud strengths, infrared proparties, fourier trunsform infrared (FI-19), hulocarbons).

J. Doophys. Res., Green, Paper 2017dl



Quantitative Modeling of Magnetospheric Processes

edited by W.P. Olson (1979)

Providing an annotated list of quantilative models which serve as a reference on energy particle distribution and magnetic and electric. models, this monograph was written in conjunction with the international Magnetospheric Study's activities.



Orders under \$50.00 must be prepaid.

Published by: American Geophysical Union 2000 Florida Avenue, N.W. Washington, D.C. 20009